LG TRAINING CENTER

Training Manual

42PQ20 Plasma Display

Advanced Single Scan Troubleshooting

Life's Good

LG

NOTICE:
ALL INFORMATION CONTAINED WITHIN THIS PACKAGE IS BASED ON PRE-SALES MODEL. INFORMATION SUBJECT TO CHANGE AT FINAL PRODUCTION

Updated: September 23rd, 2009

Overview of Topics to be Discussed

Section 1

Contact Information, Preliminary Matters, Specifications, Plasma Overview, General Troubleshooting Steps, Disassembly Instructions, Voltage and Signal Distribution

Section 2

Circuit Board Operation, Troubleshooting and Alignment of :

- Switch mode Power Supply
- Y SUS Board
- Y Drive Boards (Receives Y Drive signals from Y-SUS PWB)

NEW • Z SUS Output Board (Connects directly with FPC to Panel)

- Control Board
- X Drive Boards (2)
- Main Board

NEW • Main Power Switch, deactivates all inputs from IR or Keys

42PQ20 Plasma Display

Section 1

This Section will cover Contact Information and remind the Technician of Important Safety Precautions for the Customers Safety as well as the Technician and the Equipment.

Basic Troubleshooting Techniques which can save time and money sometimes can be overlooked. These techniques will also be presented.

This Section will get the Technician familiar with the Disassembly, Identification and Layout of the Plasma Display Panel.

At the end of this Section the Technician should be able to Identify the Circuit Boards and have the ability and knowledge necessary to safely remove and replace any Circuit Board or Assembly.

IMPORTANT SAFETY NOTICE

The information in this training manual is intended for use by persons possessing an adequate background in electrical equipment, electronic devices, and mechanical systems. In any attempt to repair a major Product, personal injury and property damage can result. The manufacturer or seller maintains no liability for the interpretation of this information, nor can it assume any liability in conjunction with its use. When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury. If wires, screws, clips, straps, nuts, or washers used to complete a ground path are removed for service, they must be returned to their original positions and properly fastened.

CAUTION

To avoid personal injury, disconnect the power before servicing this product. If electrical power is required for diagnosis or test purposes, disconnect the power immediately after performing the necessary checks. Also be aware that many household products present a weight hazard. At least two people should be involved in the installation or servicing of such devices. Failure to consider the weight of an product could result in physical injury.

ESD Notice (Electrostatic Discharge)

Today's sophisticated electronics are electrostatic discharge (ESD) sensitive. ESD can weaken or damage the electronics in a manner that renders them inoperative or reduces the time until their next failure. Connect an ESD wrist strap to a ground connection point or unpainted metal in the product. Alternatively, you can touch your finger repeatedly to a ground connection point or unpainted metal in the product. Before removing a replacement part from its package, touch the anti-static bag to a ground connection point or unpainted metal in the product. Handle the electronic control assembly by its edges only. When repackaging a failed electronic control assembly in an anti-static bag, observe these same precautions.

REGULATORY INFORMATION

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and the receiver; Connect the equipment to an outlet on a different circuit than that to which the receiver is connected; or consult the dealer or an experienced radio/TV technician for help.

Contact Information

Customer Service (and Part Sales)	**(800) 243-0000**
Technical Support (and Part Sales)	**(800) 847-7597**
USA Website (GCSC)	**aic.lgservice.com**
Customer Service Website	**us.lgservice.com**
LG Web Training	**lge.webex.com**
LG CS Academy	**lgcsacademy.com** **http://136.166.4.200**

LCD-DV:	**32LG40, 32LH30, 42LG60, 42LG70, 42LH20, 42LH40, 42LH50, 47LG90**
PLASMA:	**42PG20, 42PQ20, 42PQ30, 50PG20, 50PS80, 50PS60**

Also available on the Plasma page

Plasma Panel Alignment Handbook

New Training Materials on the Learning Academy site

Published January 2009 by LG Technical Support and Training

LG Electronics Alabama, Inc. 201 James Record Road, Huntsville, AL, 35813.

Safety and Handling Regulations

1. Approximately 20 minute pre-run time is required before any adjustments are performed.
2. Refer to the Voltage Sticker on the Switch Mode Power Supply silk screening. (+/- ½ volt).
3. Be cautious of electric shock from the Backlight section, it uses high voltage AC. Check that the Power Supply and Drive Circuits are completely discharged because of residual current stored before Circuit Board removal.
4. C-MOS circuits are sensitive to static electricity.
   Use caution when dealing with these IC and circuits.
5. Exercise care when making voltage and waveform checks to prevent costly short circuits from damaging the unit.
6. Be cautious of lost screws and other metal objects to prevent a possible short in the circuitry.

Checking Points to be Considered

1. Check the appearance of the Replacement Panel and Circuit Boards for both physical damage and part number accuracy.
2. Check the model label. Verify model names and board model matches.
3. Check details of defective condition and history. Example: Oscillator failure dead set, etc…

Basic Troubleshooting Steps

Define, Localize, Isolate and Correct

•**Define** Look at the symptom carefully and determine what circuits could be causing the failure. Use your senses Sight, Smell, Touch and Hearing. Look for burned parts and check for possible overheated components. Capacitors will sometimes leak dielectric material and give off a distinct odor. Frequency of power supplies will change with the load, or listen for relay closing etc. **Observation of the front Power LED may give some clues.**

•**Localize** After carefully checking the symptom and determining the circuits to be checked and after giving a thorough examination using your senses the first check should always be the DC Supply Voltages to those circuits under test. Always confirm the supplies are not only the proper level but be sure they are noise free. If the supplies are missing check the resistance for possible short circuits.

•**Isolate** To further isolate the failure, check for the proper waveforms with the Oscilloscope to make a final determination of the failure. Look for correct Amplitude Phasing and Timing of the signals also check for the proper Duty Cycle of the signals. Sometimes "glitches" or "road bumps" will be an indication of an imminent failure.

•**Correct** The final step is to correct the problem. Be careful of ESD and make sure to check the DC Supplies for proper levels. Make all necessary adjustments and lastly always perform a Safety AC Leakage Test before returning the product back to the Customer.

42PQ20 Product Information

This section of the manual will discuss the specifications of the 42PQ20 Advanced Single Scan Plasma Display Panel.

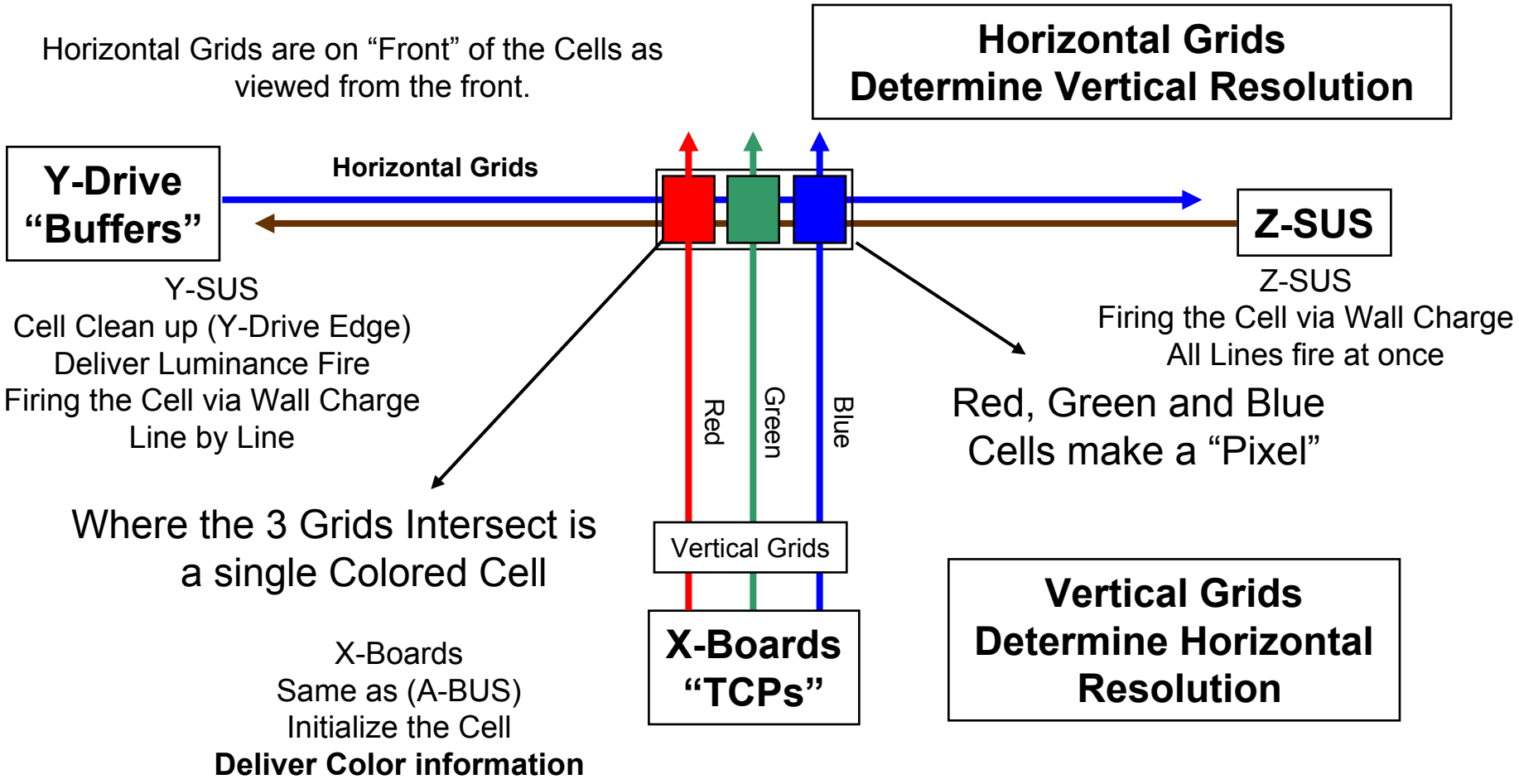
720P PLASMA HDTV

42” Class (41.5” diagonal)

- **720p HD Resolution**
- **Dual XD Engine™**
- **20,000:1 Contrast Ratio**
- **Fluid Motion**
- **3x HDMI™ V.1.3 with Deep Color**
- **AV Mode (Cinema, Sports, Game)**
- **Clear Voice**
- **LG SimpLink™ Connectivity**
- **Invisible Speaker System**
- **100,000 Hours to Half Brightness (Typical)**
- **PC Input**

Grid to Pixel to Resolution Relationship

Layout below as viewed from the rear.



Pixel Count to Resolution Comparisons

720P Logo

720P Panel

768

HD RESOLUTION 720p HD Resolution Pixels: 1365 (H) × 768 (V)
High definition television is the highest performance segment of the DTV system used in the US. It's a wide screen, high-resolution video image, coupled with multi-channel, compact-disc quality sound.

	FORMATS		
NTSC	480I	Interlaced	240 Lines
SD	480P	Progressive	480 Lines
HD	1080I	Interlaced	540 Lines
HD	720P	Progressive	720 Lines
HD	1080P	Progressive	1080 Lines

BASIC PIXEL COUNTS

720P Panel
1365 (H) × 768 (V)

1080P Panel
1920 (H) x 1080 (V)

Possible Frame Rates:
24FPS
30FPS
60FPS

Interlaced
2 Fields to make a Frame

Progressive
Each Field is a Frame

Think of sync as the Panels "Refresh Rate"

42PQ20 Specifications Logo Familiarization

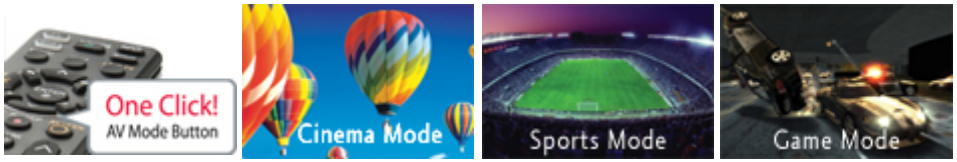
HDMI (1.3 Deep Color) Digital multi-connectivity
HDMI (1.3 Deep color) provides a wider bandwidth (340MHz, 10.2Gbps) than that of HDMI 1.2, delivering a broader range of colors, and also drastically improves the data-transmission speed.

Invisible Speaker
Personally tuned by Mr. Mark Levinson for LG
TAKE IT TO THE EDGE newly introduces 'Invisible Speaker' system, guaranteeing first class audio quality personally tuned by Mr. Mark Levinson, world renowned as an audio authority. It provides Full Sweet Spot and realistic sound equal to that of theaters with its Invisible Speaker.

Dual XD Engine
Realizing optimal quality for all images
One XD Engine optimizes the images from RF signals as another XD Engine optimizes them from External inputs. Dual XD Engine presents images with optimal quality two times higher than those of previous models.

42PQ20 Specifications Logo Familiarization

AV Mode "One click" - Cinema, Sports, Game mode.
TAKE IT TO THE EDGE is a true multimedia TV with an AV Mode which allows you to choose from 3 different modes of Cinema, Sports and Game by a single click of a remote control.



Clear Voice Clearer dialogue sound
Automatically enhances and amplifies the sound of the human voice frequency range to provide high-quality dialogue when background noise swells.

Save Energy, Save Money
It reduces the plasma display's power consumption.
The default factory setting complies with the Energy Star requirements and is adjusted to the comfortable level to be viewed at home.

Save Energy, Save Money
Home electronic products use energy when they're off to power features like clock displays and remote controls. Those that have earned the ENERGY STAR use as much as 60% less energy to perform these functions, while providing the same performance at the same price as less-efficient models. Less energy means you pay less on your energy bill. Draws less than 1 Watt in stand by.

42PQ20 Specifications Logo Familiarization

Tru-Surround is a sound-scheme that has the ability to take multi-channel encoded sources, such as Dolby Digital, and reproduce the multi-channel surround effect by just using two-speakers. The result is not as impressive as true Dolby Digital 5.1 (the front and side surround effects are impressive, but the rear surround effects fall a little short, with the sense they are coming from just to rear of your head rather than from the back of the room).

Dolby® Digital
In thousands of cinemas and millions of homes worldwide, Dolby Digital is the reigning standard for surround sound technology in general and 5.1-channel surround sound in particular.

LG SIMPLINK™ MULTI-DEVICE CONTROL
Allows for convenient control of other LG SimpLink products using the existing HDMI connection.

FluidMotion (180 Hz Effect)
Enjoy smoother, clearer motion with all types of programming such as sports and action movies.
The moving picture resolution give the impression of performance of up to 3x the Panels actual refresh rate.

FluidMotion (180 Hz Effect)

Enjoy smoother, clearer motion with all types of programming such as sports and action movies.
The moving picture resolution give the impression of performance of up to 3x the panels actual refresh rate.

LCD 60Hz

Moving Picture Response Time is 16.5 milliseconds
(120Hz takes MPRT to 8.25ms)

Panel Response Time is 4 to 8 milliseconds

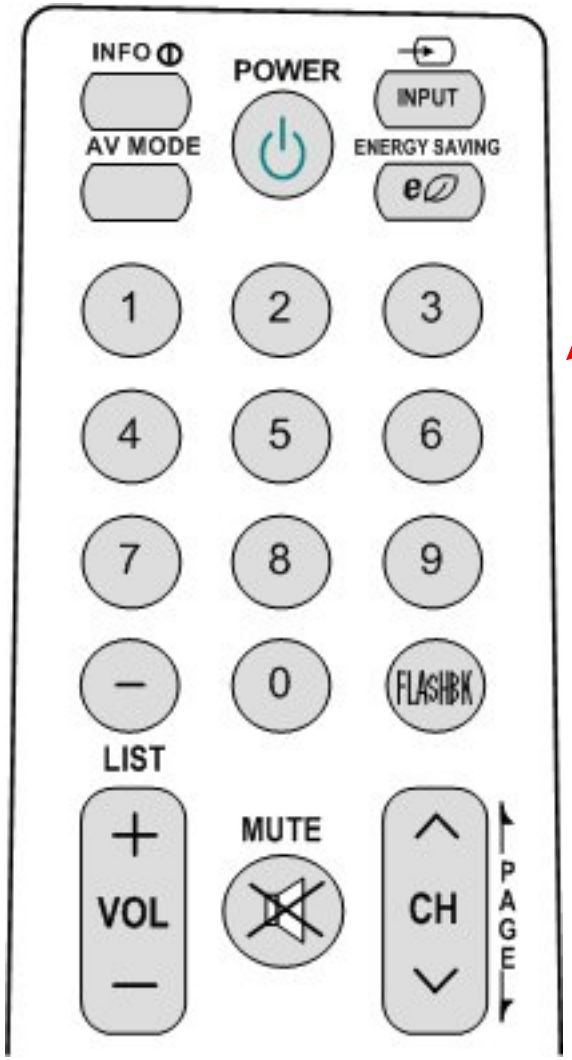
PDP 180Hz

Moving Picture Response Time is 5.44 milliseconds

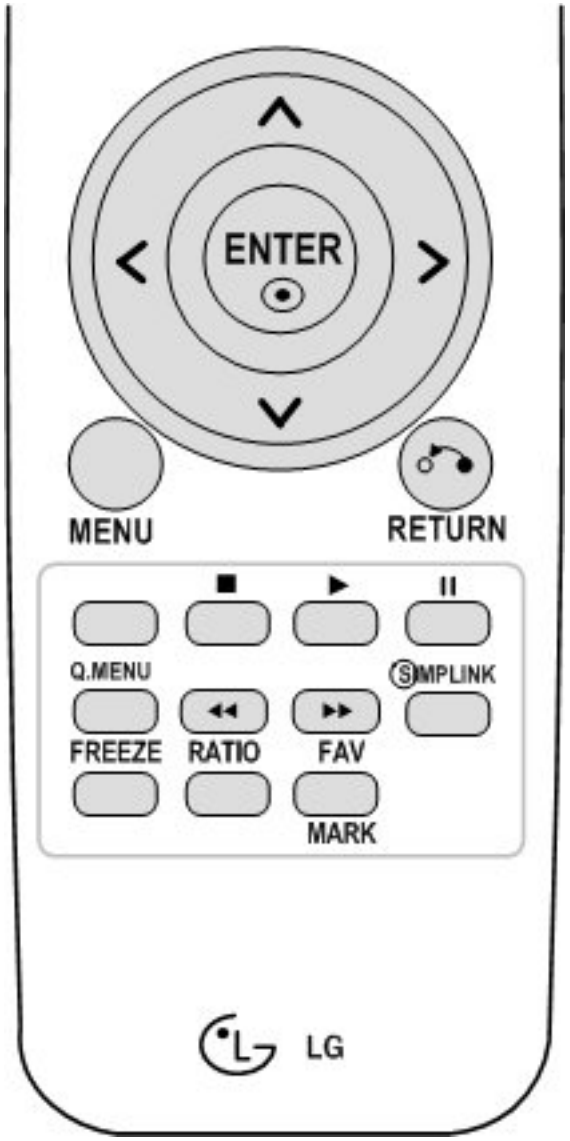
Panel Response Time is less than 1 millisecond

42PQ20 Remote Control

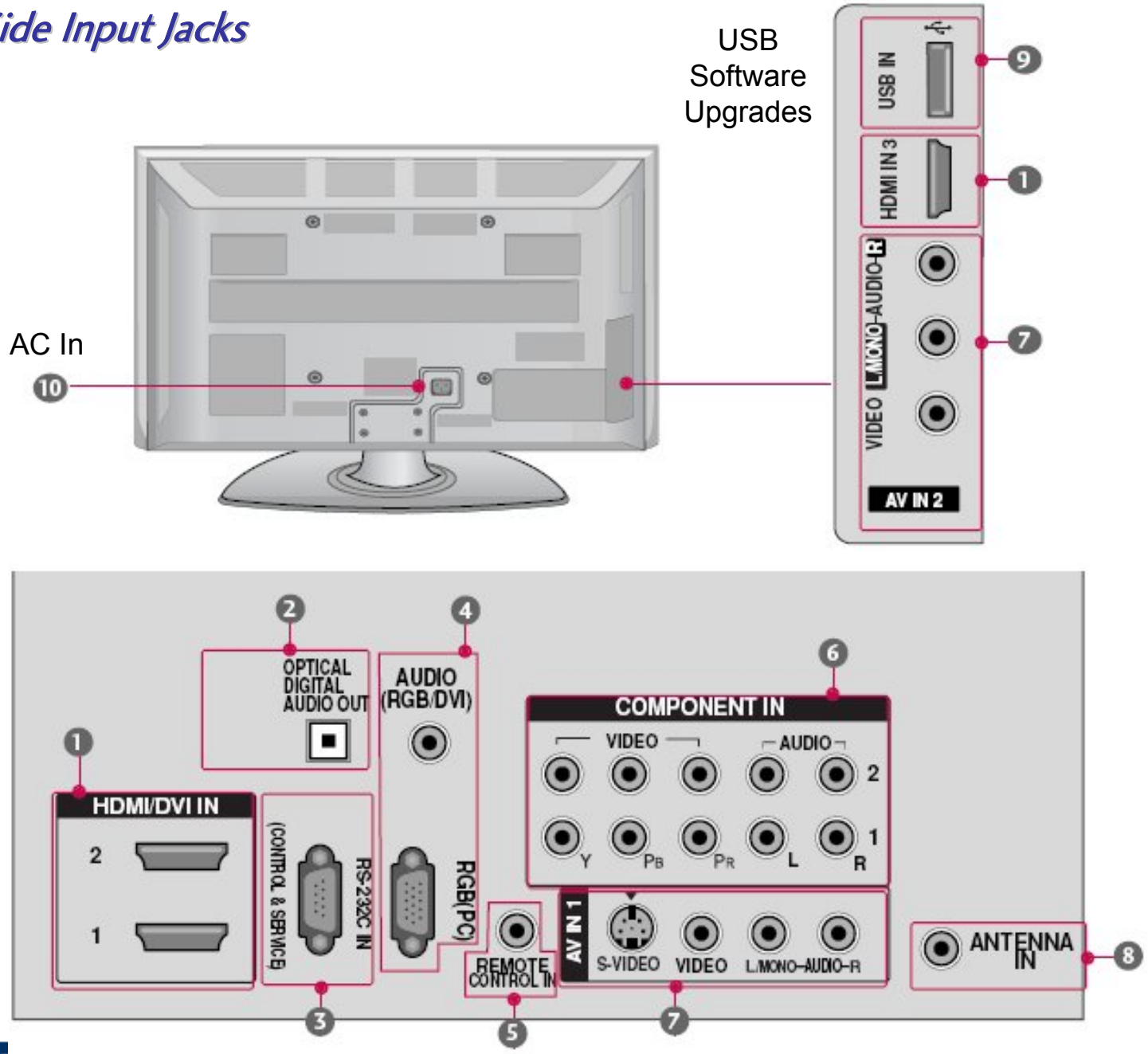
TOP PORTION



BOTTOM PORTION



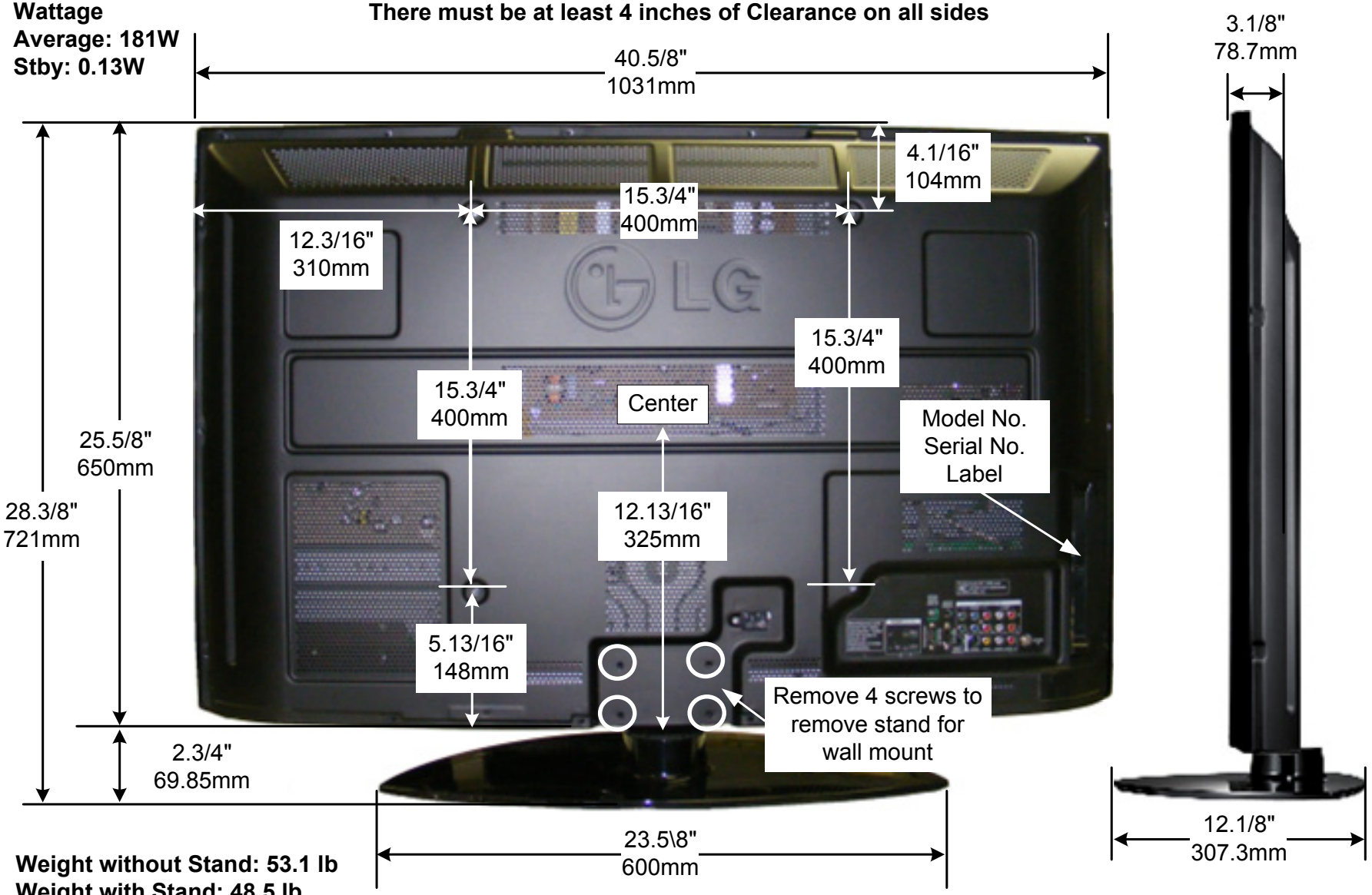
Rear and Side Input Jacks



42PQ20 Product Dimensions

Wattage
Average: 181W
Stby: 0.13W

There must be at least 4 inches of Clearance on all sides



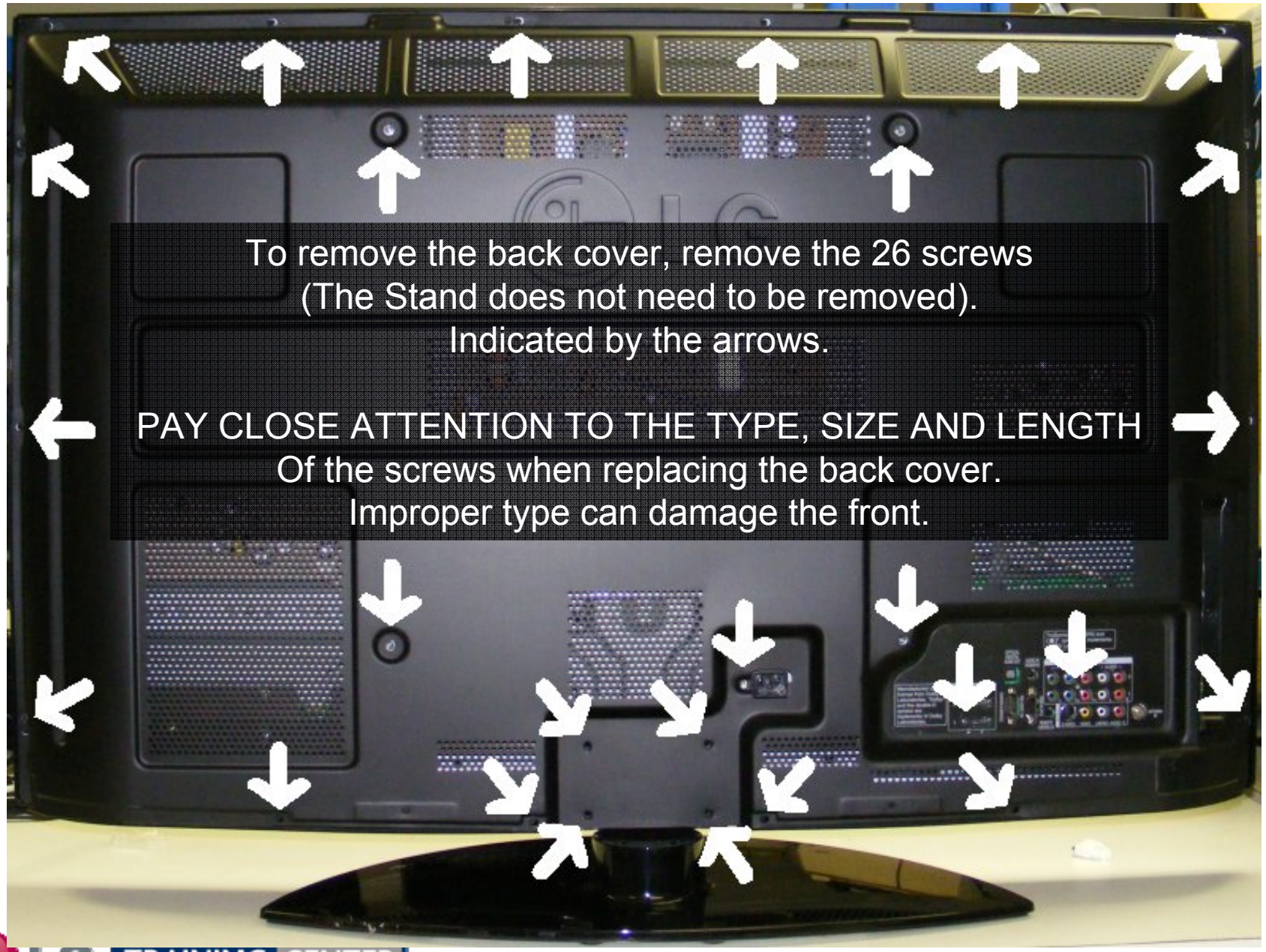
Weight without Stand: 53.1 lb
Weight with Stand: 48.5 lb

DISASSEMBLY SECTION

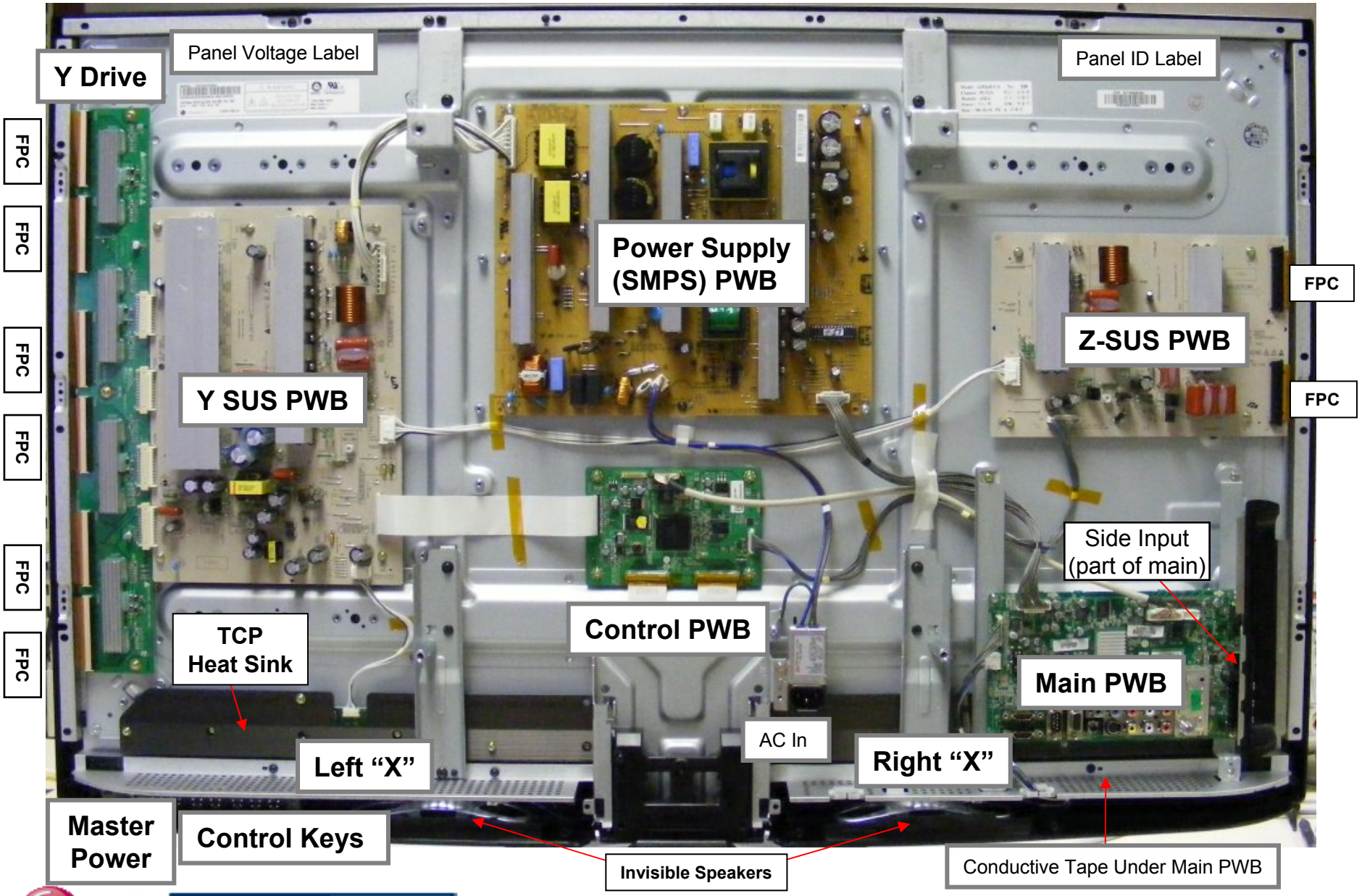
This section of the manual will discuss Disassembly, Layout and Circuit Board Identification, of the 42PQ20 Advanced Single Scan Plasma Display Panel.

Upon completion of this section the Technician will have a better understanding of the disassembly procedures, the layout of the printed circuit boards and be able to identify each board.

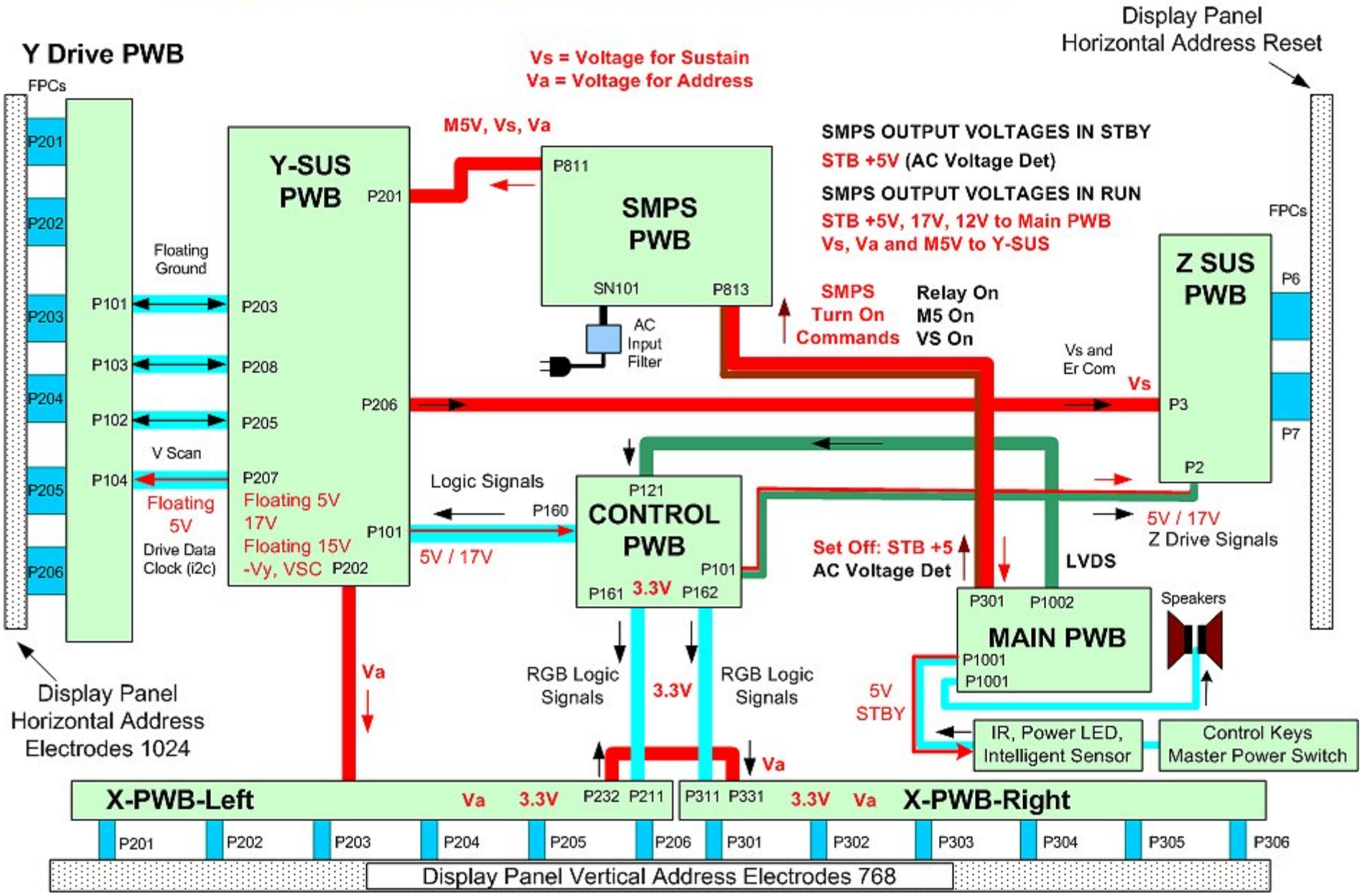
42PQ20 Removing the Back Cover



42PQ20 Circuit Board Layout



42PQ20 SIGNAL and VOLTAGE DISTRIBUTION BLOCK DIAGRAM



Disassembly Procedure for Circuit Board Removal

Notes: 1) All Plugs listed are from left to right Pin 1,2, 3, ETC.
2) Remember to be cautious of ESD as some semiconductors are CMOS and prone to static failure

Switch Mode Power Supply Board Removal

Disconnect the following connectors: P811, P813, SC101
Remove the 8 screws holding the PWB in place
Remove the PWB
When replacing, be sure to readjust the Va/Vs voltages in accordance with the Panel Label.
Confirm VSC, -Vy and ZBias as well.

Y-SUS Board Removal

Disconnect the following connectors: P201, P206, P101, P202
Remove the 7 screws holding the PWB in place
Remove the PWB by lifting slightly and sliding it to the right.
When replacing, be sure to readjust the Va/Vs voltages in accordance with the Panel Label.
Confirm VSC, -Vy and Zbias as well.

Y Drive Board Removal

Disconnect the following Flexible Ribbon Connectors: P1, P2, P3, P4, P5, P6, P7 and P8
Disconnect the following connectors: P201, P801, P101, P202
Remove the 3 screws holding the PWB in place
Remove the PWB by lifting slightly and sliding the PWB to the left unseating P204 and P200 from the Y-SUS PWB.
Note: PWB stand-offs have a small collar. The board must be lifted slightly to clear these collars.

Disassembly Procedure for Circuit Board Removal (2)

Z-SUS Board Removal

Disconnect the following connectors: P3, P2.
Disconnect the following connectors: P6 and P7. These are the FPC cables. Pull the locking caps to the right. Lift carefully the Flexible Printed Circuits (FPCs) and slide them out to the right.
Remove the 5 screws holding the PWB in place
Lift the PWB up and remove the PWB.
When replacing, be sure to readjust the Va/Vs voltages in accordance with the Panel Label.
Confirm VS, -Vy and Zbias as well.

Main Board Removal

Disconnect the following connectors: P301, P1001, P1002 and P1005
Remove the 1screws holding on the decorative plastic piece on the right side
Remove the 4 screws holding the PWB in place and Remove the PWB.

Control Board Removal

Disconnect the following connectors: P121 LVDS, P101, P111 Ribbon, P161 Ribbon and P162 Ribbon.
Remove the 4 screws holding the PWB in place Remove the PWB.

Front Key and LED PWB Removal

Remove the 2 screws holding the Key PWB in place. Remove the PWB. Disconnect P101, (Note: LED PWB is behind the Key PWB. Remove it's 2 screws and remove. Disconnect J1 and J2.

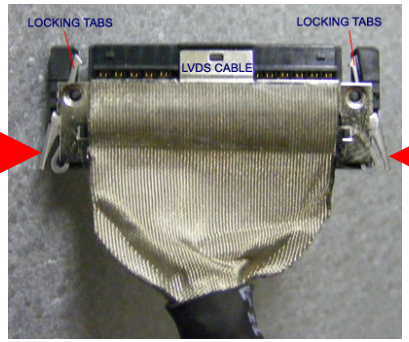
X-Drive Boards Removal

Disconnect the following connectors: P232, P211, P311 and P331
Remove the 6 screws holding the Heat Sink in place. Rock back and slide down to remove.
Disconnect the following connectors: P201 through P206 and P301 through P306
Remove the 3 screws holding each of the X Drive PWBs in place (8 total)
Remove the PWBs.

X Drive Circuit Board Removal Continued

Lay the Plasma down carefully on a padded surface.
Make sure AC is removed and remove the Back Cover and the Stand.
Carefully remove the LVDS Cable **P121** from the Control Board by pressing the Locking Tabs together and Pull the connector straight back to remove the cable see illustration below. (This prevents possible damage).

Press Inward



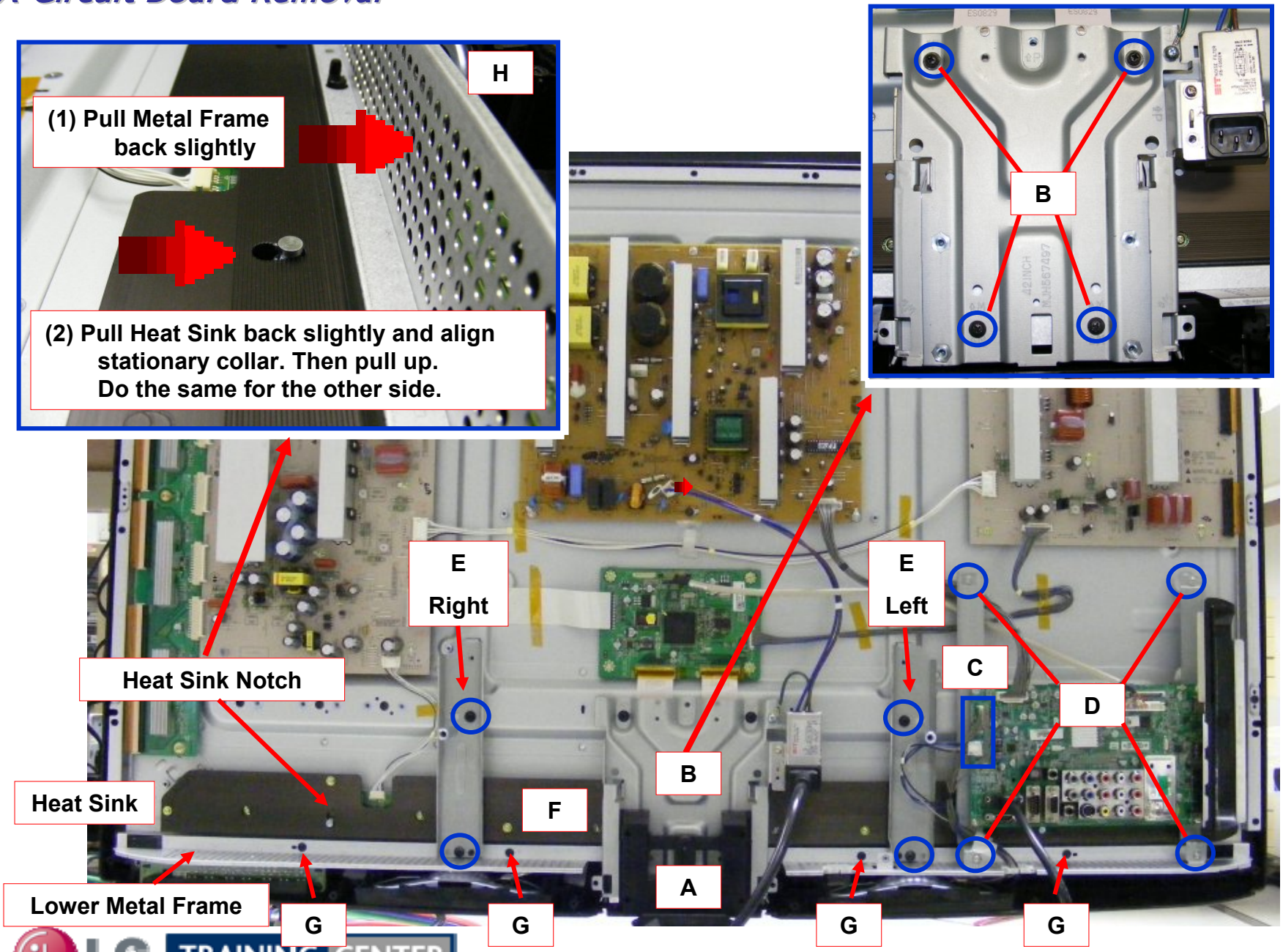
Press Inward

LVDS Cable Connector

(A) Remove the Stand mount (4 Screws removed during back removal).
(B) Remove the Stand Metal Support Bracket (4 Screws).
(C) Remove connector P1001 and P1005.
(D) Remove the 4 screws from the Main Board Mounting Bracket. (Note: Decorative Plastic Piece on right does not need to be removed)
Carefully reposition the Main Board and Mounting Bracket up and off to the right side.
(E) Remove the metal support Braces marked “E”. Note: There is a Left and a Right brace.
(F) Remove the 6 screws holding the Heat Sink.
(G) Remove the 4 screws (black self tapping) that attach the lower metal frame to the cabinet.
(H) Carefully flex the bottom frame metal assembly, while pulling the Heat Sink until the alignment notch can slide out. (Be careful remember that the TCP IC’s are located under the HEAT SINK).

X-DRIVE PWBs REMOVAL:
Disconnect all TCP ribbon cables from the defective X-Drive PWB. Remove the 4 screws holding the PWB in place. Remove the PWB. Reassemble in reverse order. Recheck Va / Vs / VScan / -VY / Z-Drive.

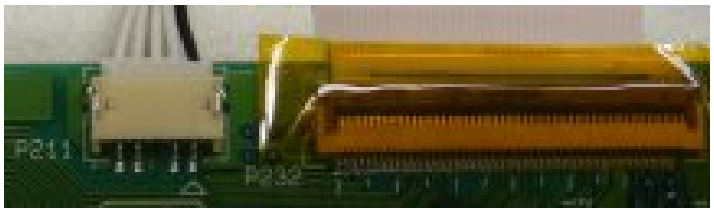
X Circuit Board Removal

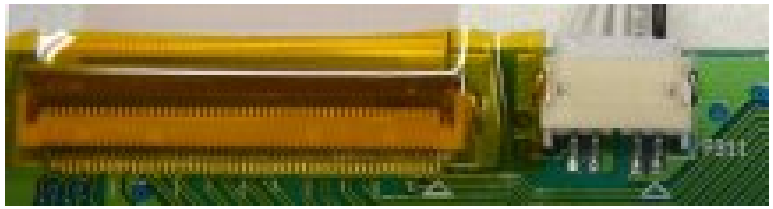


Left and Right X Drive Removal

After removing the back cover, Main PWB is lifted out of the way, 6 screws removed from heat sink covering heat sink and TCPs removed, the X-Drive PWBs can be removed.

Showing the tape on the connectors P232 or P331





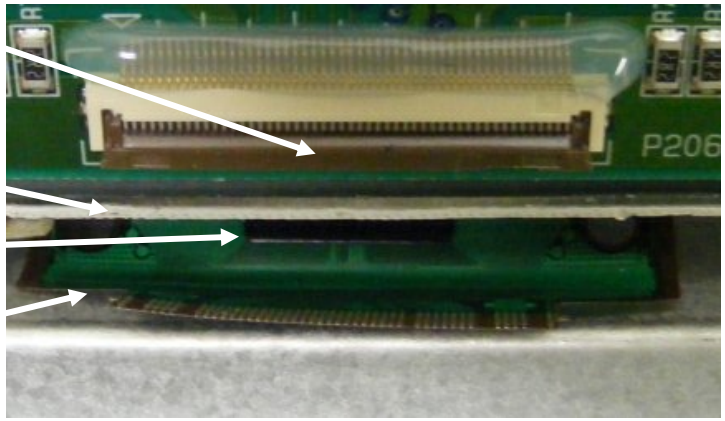
Peel the tape off the connectors

Gently pry the locking mechanism upward and remove the ribbon cable from the connector.

Removing TCPs.

Gently lift the locking mechanism upward on all TCP connectors P201~206 or P301~306

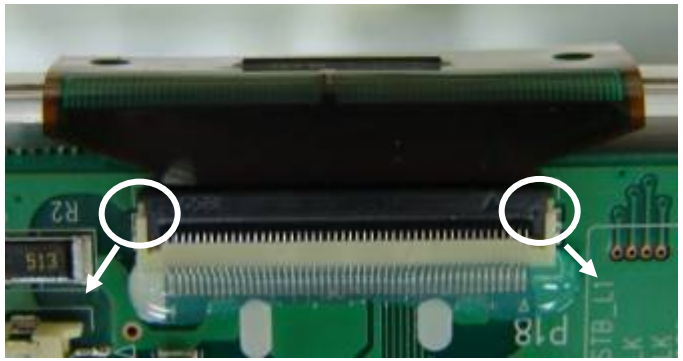
Carefully lift the TCP ribbon up and off.



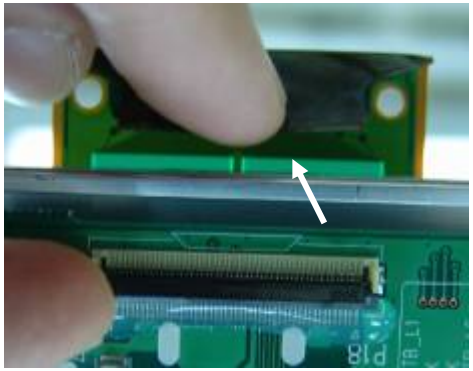
TCP (Tape Carrier Package) Generic Removal Precautions

Note:
These picture are taken from a different model. But the precautions are the same.

TCP Connector Removal



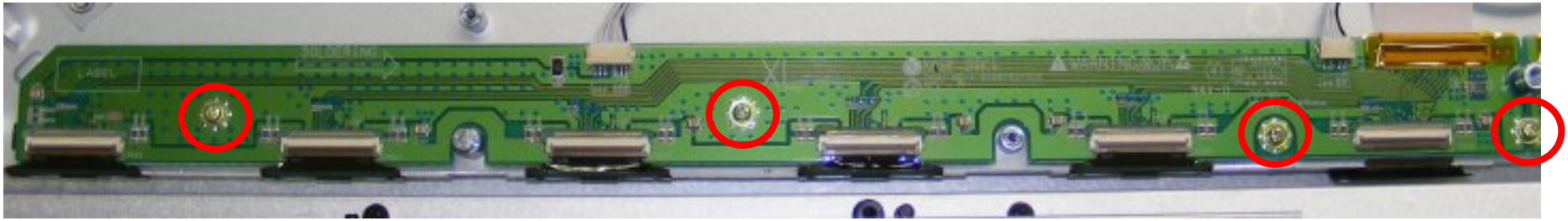
Lift up the lock as shown by arrows.
(The Lock can be easily broken.
It needs to be handled carefully.)



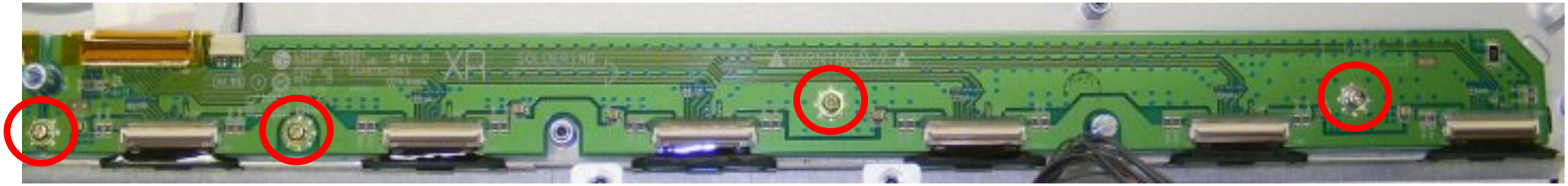
Pull TCP apart as shown by arrow.
(TCP Film can be easily damaged.
Handle with care.)

Left and Right X Drive Removal

Remove the 4 screws for either PWB or 7 total for both. (The Center screw secures both PWBs)



Left X Board drives the right side of the screen



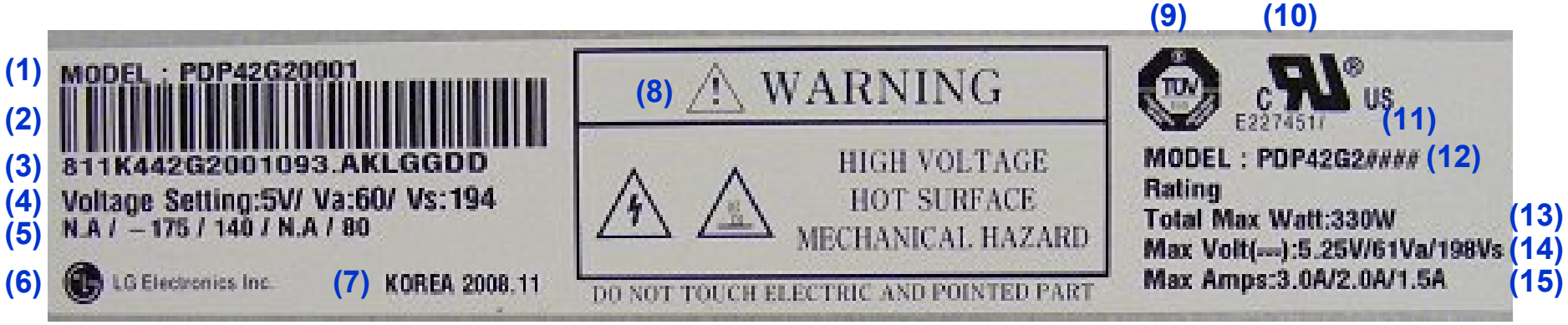
Right X Board drive the left side of the screen

42PQ20 Plasma Display

This Section will cover Circuit Operation, Troubleshooting and Alignment of the Power Supply, Y-SUS Board, Y Drive Boards, Z-SUS Board, Control Board, Main Board and the X Drive Boards.

At the end of this Section the technician should understand the operation of each circuit board and how to adjust the controls. The technician should be able with confidence to troubleshoot a circuit board failure, replace the defective circuit and perform all necessary adjustments.

Panel Label Explanation



(1) Model Name
(2) Bar Code
(3) Manufacture No.
(4) Adjusting Voltage DC, Va, Vs
(5) Adjusting Voltage (Set Up / -Vy / Vsc / Ve / Vzb)
(6) Trade name of LG Electronics
(7) Manufactured date (Year & Month)
(8) Warning

(9) TUV Approval Mark
(10) UL Approval Mark
(11) UL Approval No.
(12) Model Name
(13) Max. Watt (Full White)
(14) Max. Volts
(15) Max. Amps

Adjustment Notice:

ALL adjustments (DC or Waveform) are done in "White Wash"

It is critical that the DC Voltage adjustments be checked when;

1) **SMPS, Y-SUS or Z-SUS PWB is replaced.**
2) **Panel is replaced, Check Va/Vs since the SMPS does not come with new panel**
3) **A Picture issue is encountered**
4) **As a general rule of thumb when ever the back is removed**

ADJUSTMENT ORDER "IMPORTANT"

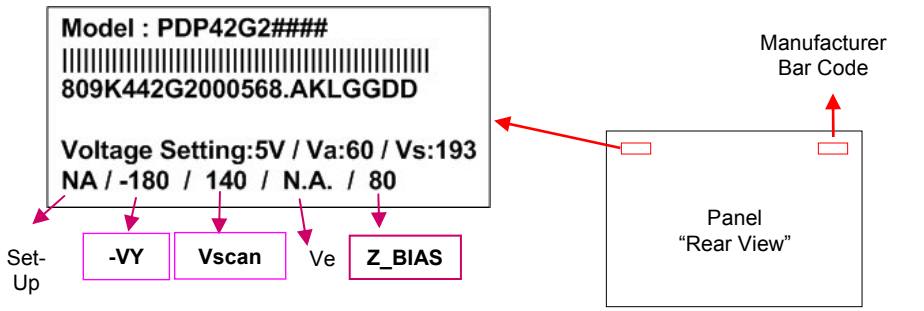
DC VOLTAGE ADJUSTMENTS

1) **SMPS PWB: Va Vs** (Always do SMPS first)
2) **Y-SUS PWB: Adjust –Vy, Vscan,**
3) **Z-SUS PWB: Adjust ZBias**

WAVEFORM ADJUSTMENTS

1) **Y-SUS PWB: Set-Up, Set-Down**

Remember, the Voltage Label MUST be followed, it is specific to the panel's needs.



All label references are from a specific panel. They are not the same for every panel encountered.

The Waveform adjustment is only necessary

1) When the Y-SUS PWB is replaced
2) When a "Mal-Discharge" problem is encountered
3) When an abnormal picture issues is encountered

SWITCH MODE POWER SUPPLY SECTION

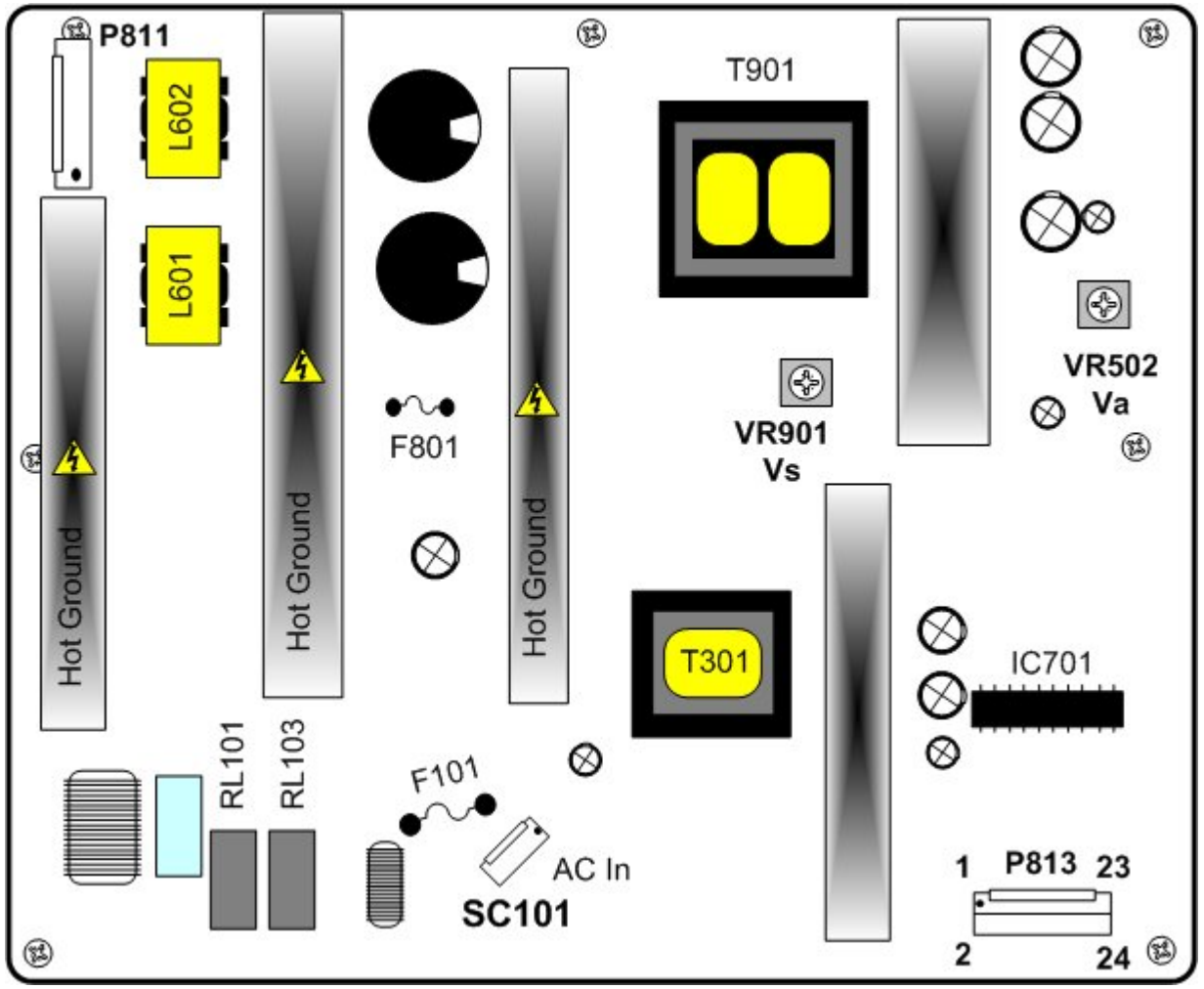
This Section of the Presentation will cover troubleshooting the Switch Mode Power Supply for the Single Scan Plasma. Upon completion of the section the technician will have a better understanding of the operation of the Power Supply Circuit and will be able to locate voltage and test points needed for troubleshooting and alignments.

- DC Voltages developed on the SMPS
- Adjustments VA and VS.

- Always refer to the Voltage Sticker located on the back of the panel, in the upper Left Hand side for the correct voltage levels for the VA, VS, -VY, Vscan, and Z Bias as these voltages will vary from Panel to Panel even in the same size category.
- Set-Up and Ve are just for Label location identification and are not adjusted in this panel.

Power Supply PWB Layout

Hot Ground Symbol represents a SHOCK Hazard



P811

1	Vs
2	Vs
3	n/c
4	GND
5	GND
6	Va
7	Va
8	GND
9	M5V
10	M5V

P813

1	17V	2	17V
3	Gnd	4	Gnd
5	12V	6	12V
7	Gnd	8	Gnd
9	5V	10	5V
11	5V	12	5V
13	Gnd	14	Gnd
15	Gnd	16	Gnd
17	5V Det	18	AC Det
19	RL ON	20	VS ON
21	M5 ON	22	Auto Gnd
23	Stby5V	24	Key On

Switch Mode Power Supply Overview

The Switch Mode Power Supply Board Outputs to the :

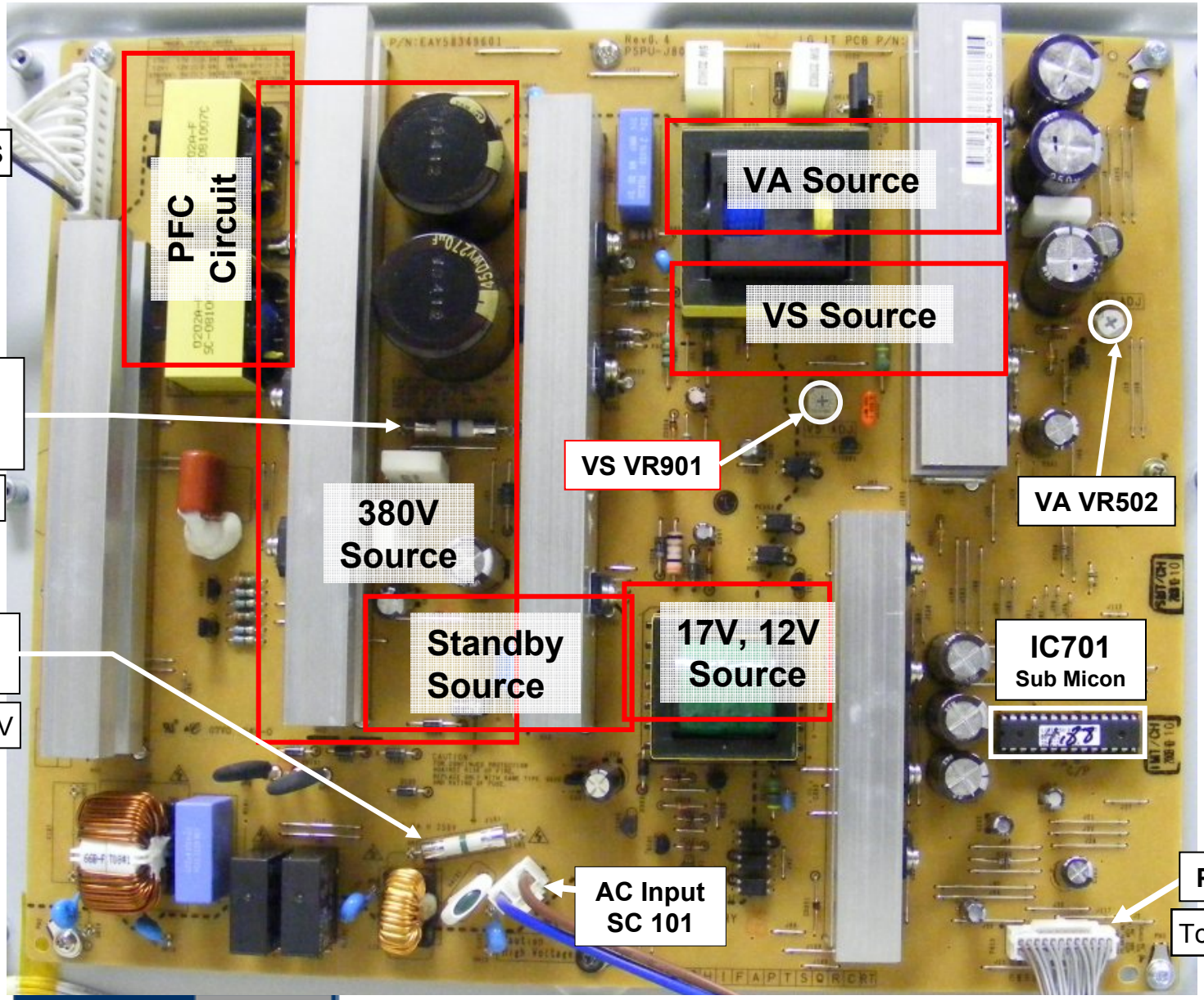
Y-SUS Board	**VS**	**Drives the Display Panel Horizontal Grid**
	VA	**Primarily responsible for Display Panel Vertical Grid**
	M5V VCC	**Used to develop Bias Voltages on the Y-SUS, X Drive, and Control Boards**

Main Board	**16V**	**Audio B+ Supply**
	5V	**Signal Processing Circuits**

There are 2 adjustments located on the Power Supply Board VA and VS. The 5V VCC is pre-adjusted and fixed. All adjustments are made with relation to Chassis Ground. Use "Full White Raster" 100 IRE

Adjustments	**VA**	**RV901**
	VS	**RV951**

Switch Mode Power Supply Circuit Layout



Power Supply Basic Operation

AC Voltage is supplied to the SMPS Board at Connector SC101 from the AC Input Filter. Standby 5V is developed from 90V source supply (which during run measures 359V). This supply is also used to generate all other voltages on the SMPS.

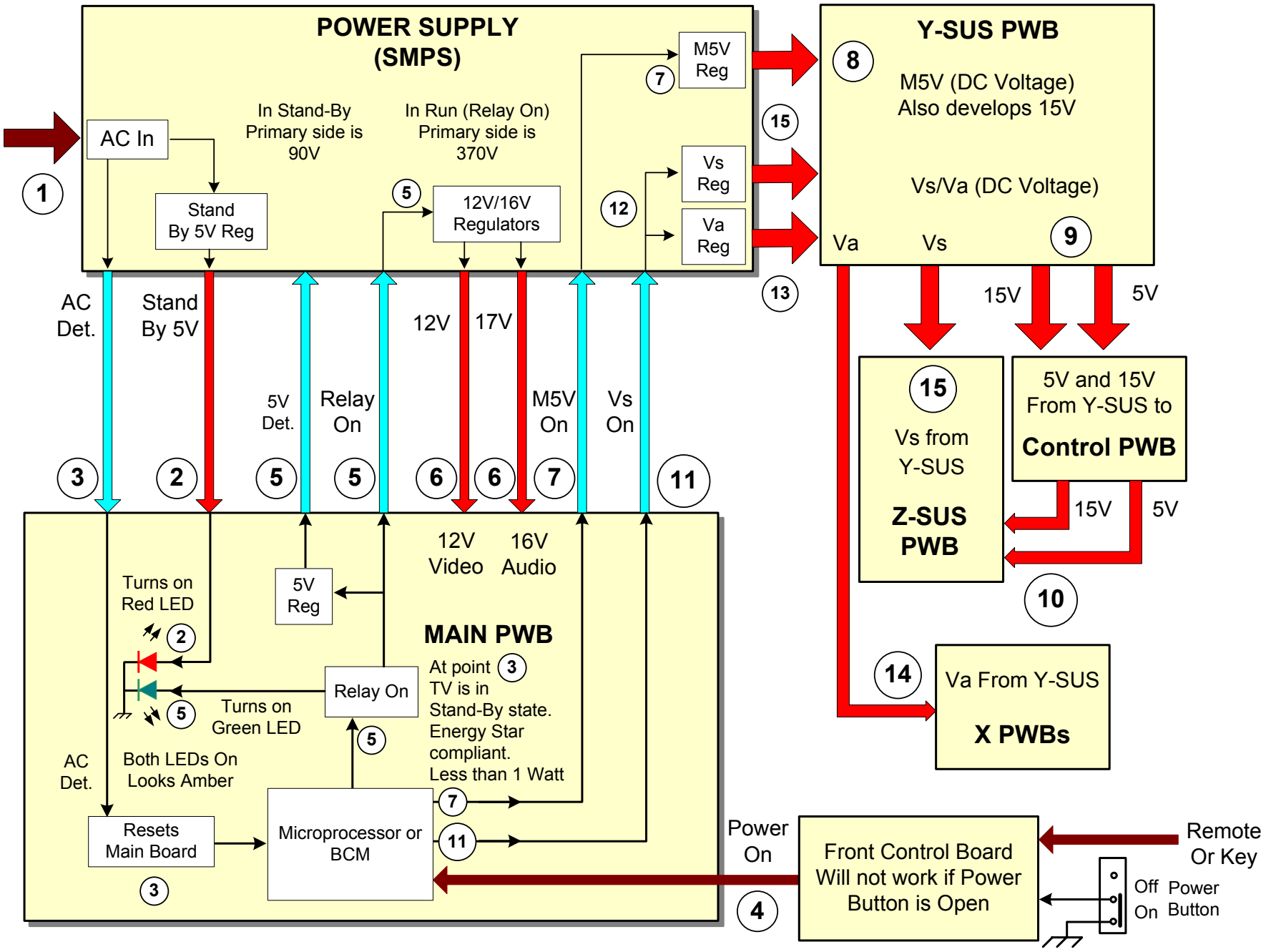
The 5V (standby) voltage is routed to the Sub Micon circuit (IC701) on the SMPS and through P813 to the Main PWB for Micon (IC1) operation. AC detect Pin 18, P813 is generated on the SMPS by monitoring the AC input and rectifying a small sample voltage. This **AC Detect** Voltage is routed to (IC701) the Sub Micon on the SMPS and through pin 18 of PG813 to the Micon (IC1) located on the Main Board and is used to **Reset** the Main Board.

When the Micon (IC1) on the Main Board receives an " ON " Command from either the Keyboard or the Remote IR Signal it outputs a high called **RL ON**. This signal first turns on a DC level shifter on the main board which creates a voltage called 5V General. This 5V General now provides the pull up voltages which supply the output control circuits to the SMPS. The RL ON enters the SMPS Board (Pin 19 of P813). At the same time, the 5V General voltage also creates a signal called **5V Det.** This is routed to the main Micon and to the SMPS (Pin 17 PG813) notifying the SMPS sub-Micon that the main board is functioning. The RL ON Voltage is sensed by the Sub Micon (IC701) circuit which causes the Relay Drive Circuit to close both Relays RL101 and RL103 bringing the PFC source up to full power by increasing the 90V standby to 340V which can be read Fuse F801. At this time the 17V and 12V sources becomes active and are sent to the Main Board via P813. (17V pins 1 and 2 and 12V at pins 5 and 6 of P813)

The next step is for the Micon (IC1) on the Main Board to output a high on **M5V ON** Line to the SMPS at P813 Pin 21 which is sensed by the Sub Micon IC (IC701) on the SMPS turning on the M5V line from P811pins 9 and 10 to the Y-SUS board.

The last step to bring the supply to "Full Power" occurs when the Micon (IC100) on the Main Board brings the **VS-ON** line high at Pin 20 of P813 on the SMPS Board which when sensed by the Sub Micon IC (IC701) turns on the VA and VS Supplies (VA pins 6 and 7 is brought high before VS pins 1 and 2) and output from P811 to the Y-SUS board.

42PQ20 POWER SUPPLY START UP SEQUENCE



Power Supply Generic Troubleshooting Tips

Remember if a voltage is missing check for proper resistance before proceeding

Understanding the Power On Sequence when Troubleshooting a possible Power Supply Failure will simplify the process of isolating which circuit board failed to operate properly. In this Section we will investigate the Power on Sequence and examine ways to locate quickly where the failure occurred.

When Power is pressed, listen for a Relay Click, the click of the Relay is an indication of RL-ON going high. RL-ON is sent from the Main Board to the SMPS and when present the IC701 controls the operation of both Relays. RL-ON going High and no Relay is a failure of the SMPS, RL-ON staying low is a failure of the Main Board or something between.

Relay Operation means that the SMPS if working properly will output the 17V and 12V Supplies to the Main Board. These voltages will allow the Tuner, Audio and Video Circuits on the Main Board to function and if connected to an Antenna Input, Audio would be present. If the Relays closes and these supplies failed suspect a problem with the SMPS or an excessive load on the line.

The next step of operation calls for the M5V ON line from the Main Board to the SMPS to go high on P813 pin 21. A high on the M5V ON Line activates the M5V line to the Y-SUS Board. Loss of M5V results in no “Raster”, no Display Panel Reset, no Y, Z, Control or X Board operation. Loss of M5V and/or M5V ON going high could be caused by any of these boards or failure of the SMPS. M5V ON staying low indicates a problem on the Main Board.

VS-ON is the last step of the Power Sequence and is responsible for bringing the VS and VA Voltages up.
The VS ON signal pin 20 P813 is sent from the Main Board to the SMPS as a high, VS and VA and full operation of the Display Panel are now enabled. Loss of VS-ON results in loss of VA and VS and no Raster, no Panel Display Reset but Audio would be present. If VS-ON went high and VS and VA where missing the problem could be caused by a failure on the SMPS or a circuit using these voltages. A Resistance check should narrow the possible failures quickly.

Power Supply Static Test Explained

This test can confirm the proper operation of the SMPS without the need to exchange the board. This Power Supply can operate in a No Load State. This means that by applying AC power to SC101 and all other plugs disconnected, this power supply will function.
Simply removing P813 (Lower Right Hand Side of the PWB), will cause the "AUTO" Pin 22 to go high from its normal low state allowing the Power Supply to go to full power on mode when AC Power is Supplied. *Be careful after this test and make sure the VA and VS lines have discharged before reconnecting the supply cables.*

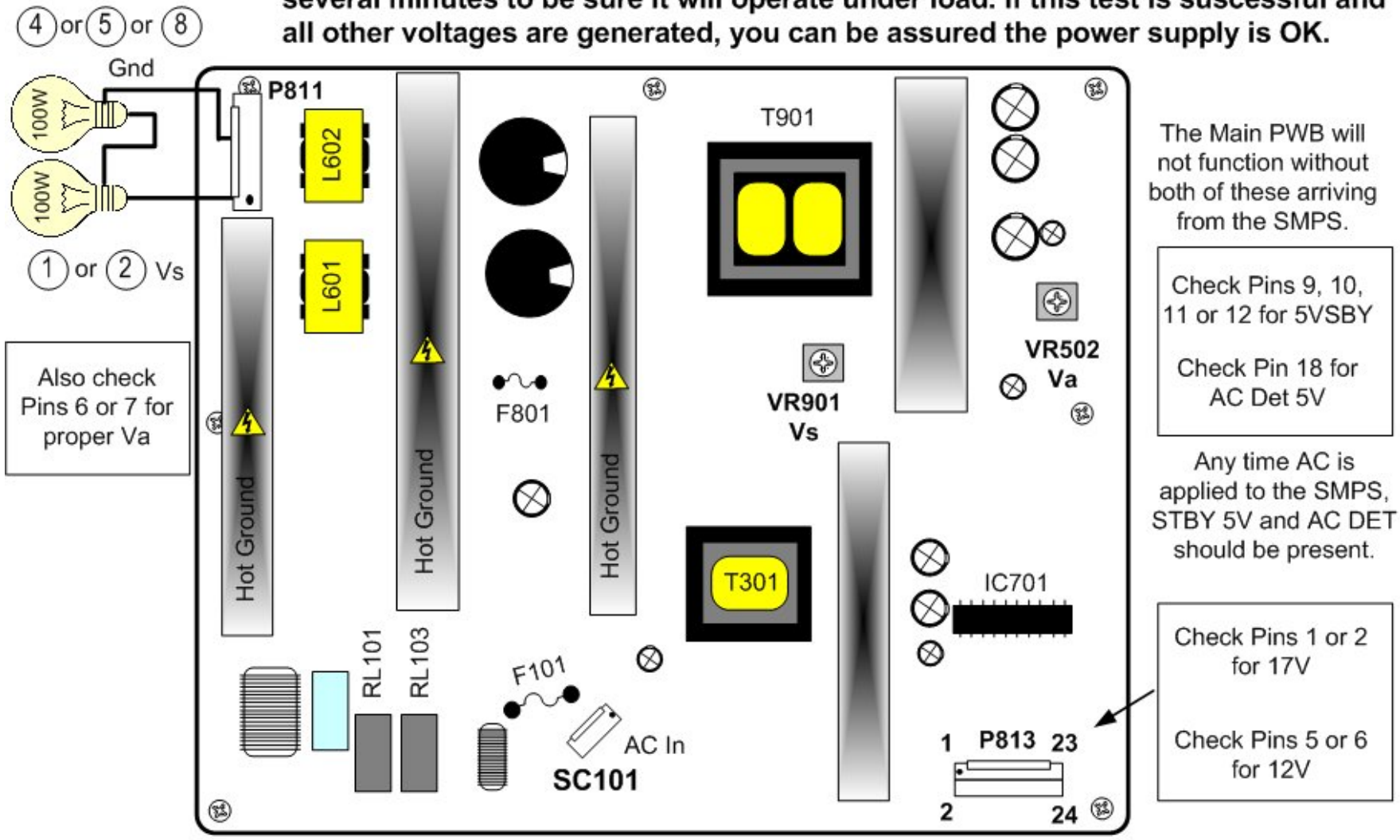
For a "Stand-Alone" static test for the Power Supply, apply the usual 2 100Watt light Bulbs in series test between Vs output and chassis ground for a simulated 200Watt load. If the Power Supply operates in this condition, it is assured it can maintain its output power under load.

If the Y-SUS, Z-SUS and X PWBs are working normal, when the SMPS comes up to full power on, "Display Panel Reset" will be visible. Shorting the Auto Pattern Gen. test points at this time should result with test patterns on the screen.

If either Y-SUS or Z-SUS is causing the power supply to shutdown, unplug the Z-SUS.
(Remember, Vs is routed to the Z-SUS PWB P3 from the Y-SUS P206 pins 1 & 2.
This will allow the Y-SUS to function. Also, if you unplug the Y-SUS from the SMPS and jump the 5V VCC line to any 5V location on the Control Board the Control PWB will function.

Static Test Under Load (Light Bulb Test)

Using two 100 Watt light bulbs, attach on end to Vs and the other end to ground. Apply AC to SC101. If the light bulbs turn on, allow the the SMPS to run for several minutes to be sure it will operate under load. If this test is sucessful and all other voltages are generated, you can be assured the power supply is OK.



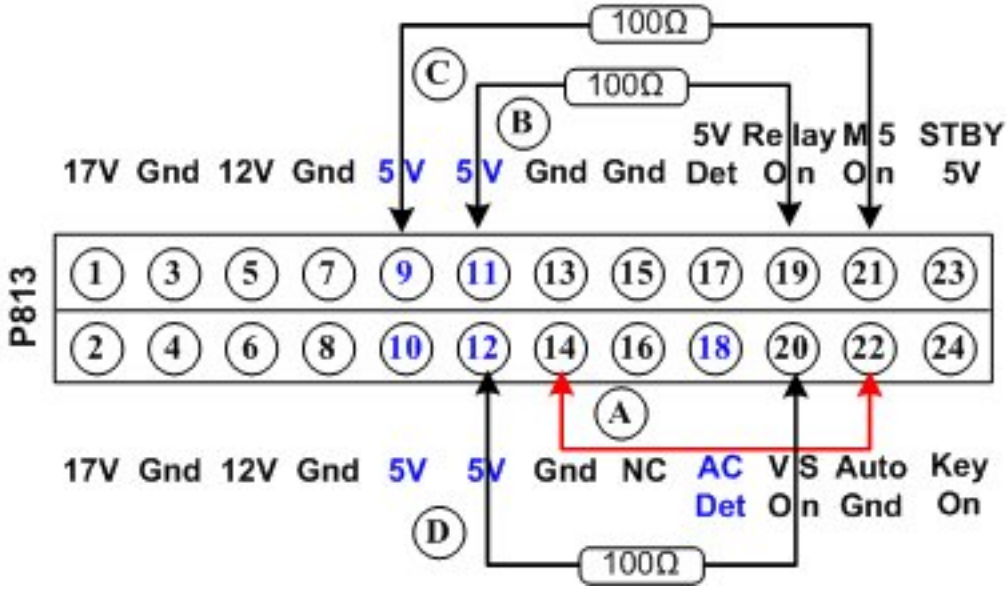
Note: The light bulb test is not necessary for the SMPS to turn on and stay on.
This SMPS will run without a load. But it is necessary to test the SMPS under a load.

Switch Mode Power Supply Static Test (Forcing on the SMPS in stages)

Use this test only if the Power Supply will come on automatically when unplugging P813, but will not come on when connected to the Main PWB, but its sending the right commands.

P811 and P813 are removed from the Power Supply

Remove AC, apply the next step and then reapply AC



(A) Ground the Auto Ground (Pin 22) on P813

When AC Power is applied, Check AC Det (Pin 18) and 5V Stand-By (Pins 9 ~ 12) are 5V.

(B) 100Ω ¼ watt resistor added from 5V STB (Pins 9 ~ 12) to RL ON (Pin 19) closes relay RL101 and RL103 turning on the 17V and 12V Supplies.

(C) 100Ω ¼ watt resistor added from 5V STB (Pins 9 ~ 12) to M5 ON (Pin 21) brings the M5V (P811 pins 9, 10) line high.

(D) 100Ω ¼ watt resistor added from 5V STB (Pins 9 ~ 12) to VS ON (Pin 20) brings the VA and VS (P811 pins 1 and 2 Vs and Pins 6 and 7 Va) Lines high

SMPS Va and Vs Adjustments

Use Full White Raster "White Wash"

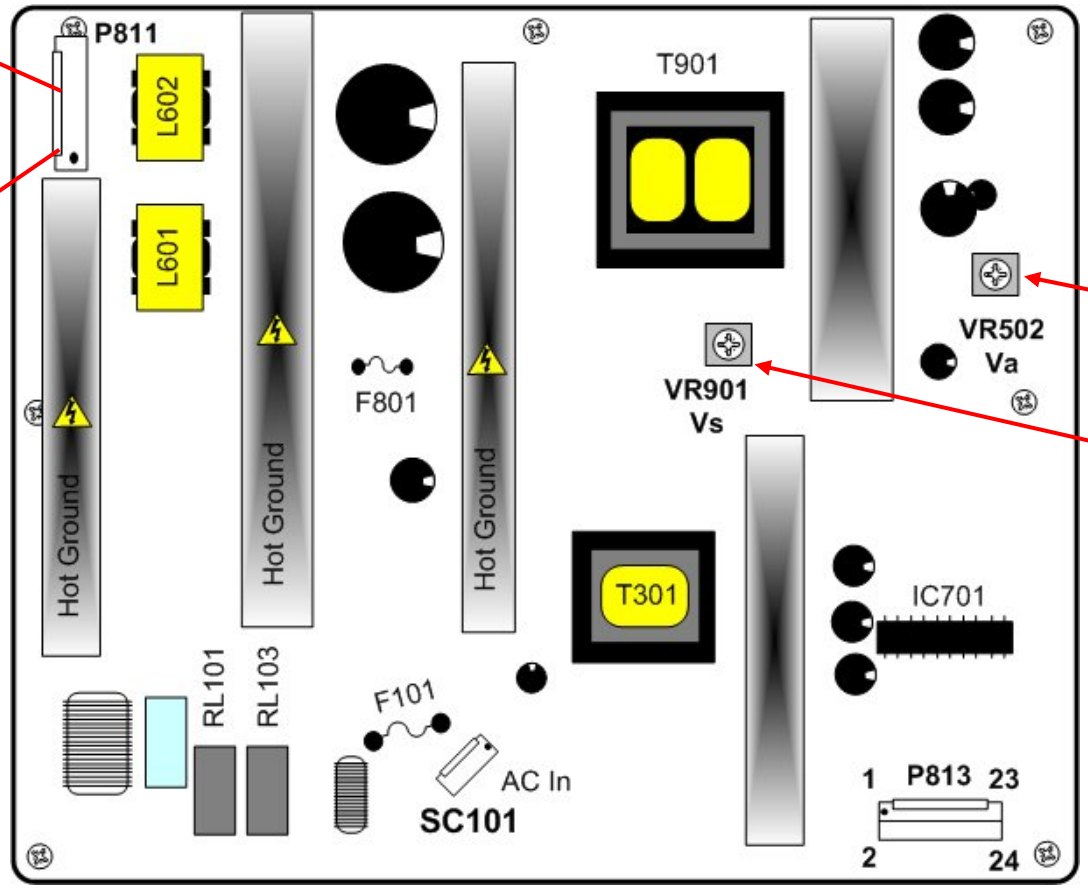
Pull P813. Apply AC Power. Power Supply Starts Automatically.

This Power Supply will come up and run with "NO" load on P811. But, check using 200W light bulb test.

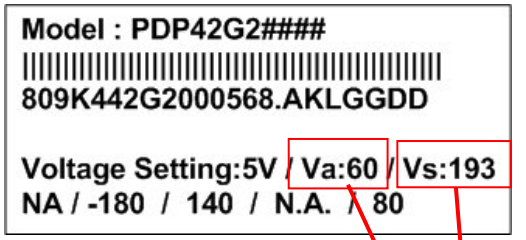
With P811 in circuit, Y & Z SUS Run. Both Y and Z waveforms are generated.

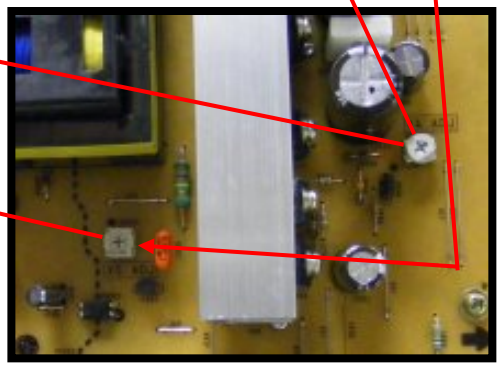
Va TP P811 Pin 6 or 7

Vs TP P811 Pin 1 or 2



Panel Voltage Label





Important: Use the Panel Label Not this book for all voltage adjustments.

SC101 and P811 Pin ID and Voltages

Voltage and Resistance Measurements for the SMPS.
All voltages from a working unit. All Diode Mode Checks from disconnected PWB.

SC101 AC INPUT

Connector	Pin Number	Standby	Run	Diode Mode
SC101	1 and 3	120VAC	120VAC	Open

P811 CONNECTOR "Power Supply PWB“ to Y-SUS

Pin	Label	STBY	Run	Diode Mode
1	Vs	0V	*193V	Open
2	Vs	0V	*193V	Open
3	Gnd	0V	0V	Gnd
4	n/c	n/c	n/c	n/c
5	Gnd	0V	0V	Gnd
6	Va	0V	*60V	Open
7	Va	0V	*60V	Open
8	Gnd	0V	0V	Gnd
9	M5V	0V	5V	2.99V
10	M5V	0V	5V	2.99V

*** Note: This voltage will vary in accordance with Panel Label**

P813 Connector ID and Voltages

Voltage and Diode Mode Measurements for the SMPS

P813 CONNECTOR Odd "SMPS" to P301 "Main PWB"

Pin	Label	STBY	Run	No Load	Diode Mode
1	17V	0V	17.3V	17.3V	Open
3	Gnd	Gnd	Gnd	Gnd	Gnd
5	12V	0V	12V	12V	Open
7	Gnd	Gnd	Gnd	Gnd	Gnd
9	Stby 5V	5V	5V	5V	1.1V
11	Stby 5V	5V	5V	5V	1.1V
13	Gnd	Gnd	Gnd	Gnd	Gnd
15	Gnd	Gnd	Gnd	Gnd	Gnd
17	5V Det	0V	5V	5V	3.1V
19	RL On	0V	3.73V	0V	Open
21	M5 ON	0V	3.26V	0V	Open
23	Stby5V	5V	5V	5V	Open

Pin	Label	STBY	Run	No Load	Diode Mode
2	17V	0V	17.3V	17.3V	Open
4	Gnd	Gnd	Gnd	Gnd	Gnd
6	12V	0V	12V	12V	Open
8	Gnd	Gnd	Gnd	Gnd	Gnd
10	Stby 5V	5V	5V	5V	1.1V
12	Stby 5V	5V	5V	5V	1.1V
14	Gnd	Gnd	Gnd	Gnd	Gnd
16	n/a	-	-	-	n/a
18	AC Det	5V	5V	5V	1.0V
20	Vs On	0V	3.2V	0V	Open
22	AUTO	0V	0V	5V	Open
24	Key On	0V	0V	5V	Open

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Y-SUS PWB SECTION (Overview)

Y-SUS Board develops the Y-Scan to the Y-Drive boards.

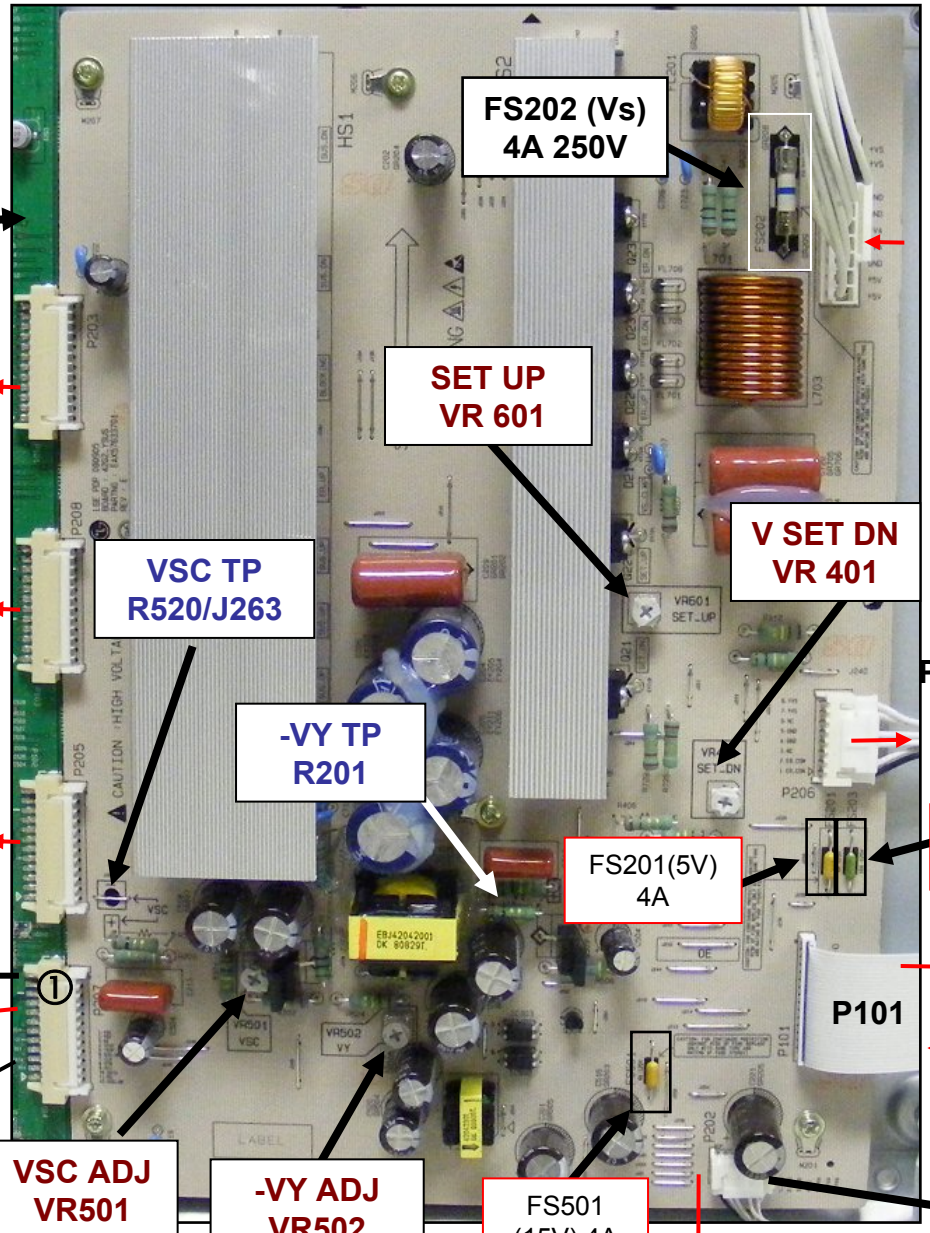
This Section of the Presentation will cover troubleshooting the Y-SUS Board for the Single Scan Plasma. Upon completion of the Section the technician will have a better understanding of the operation of the circuit and will be able to locate voltage and resistance test points needed for troubleshooting and alignments.

- Adjustments
- DC Voltage and Waveform Checks
- Resistance Measurements

Operating Voltages

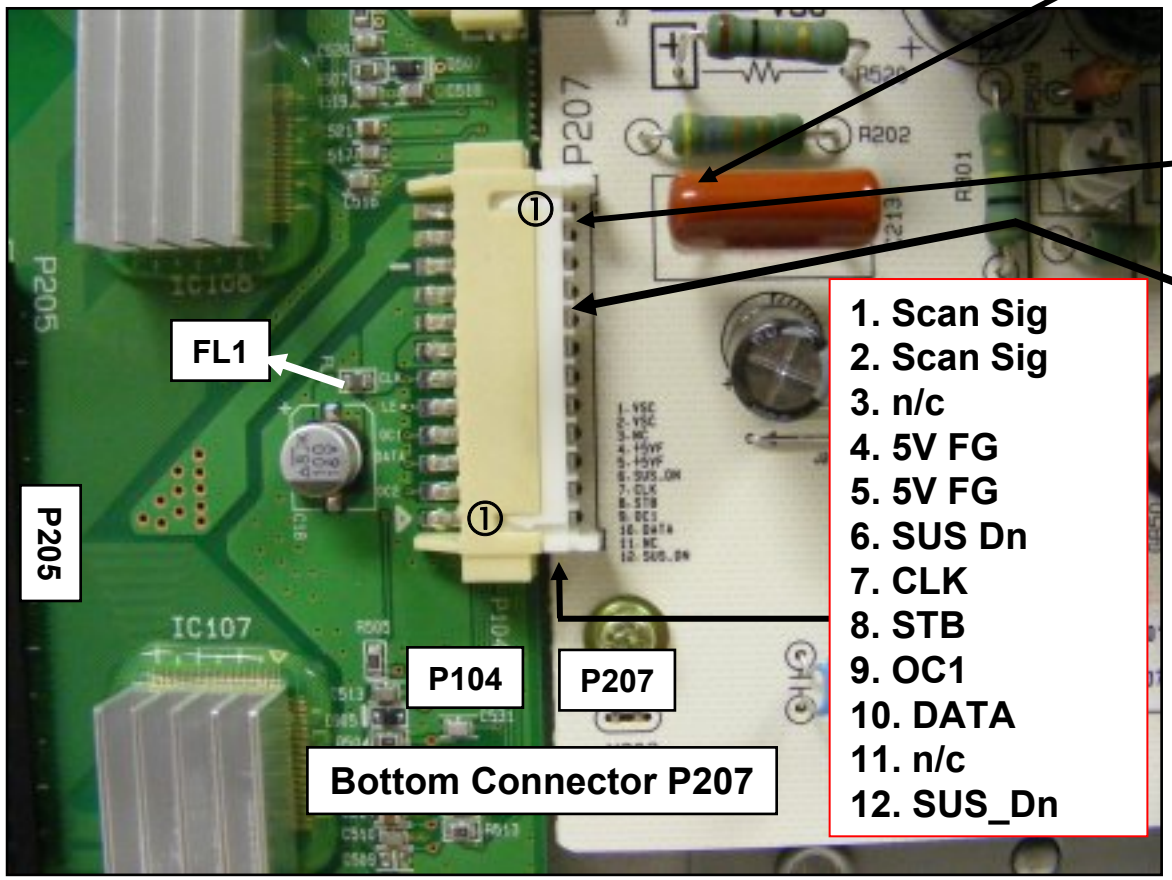
SMPS Supplied	VA	VA supplies the Panel Vertical Grid (Routed to the X-Boards)
	VS	VS Supplies the Panel Horizontal Grid (Also routed to the Z-SUS)
	M5V	5V Supplies Bias to Y-Z SUS, (Routed to the Control Board)
Y-Z SUS Developed	-VY VR502	-VY Sets the Negative excursion of the Y SUS Drive Waveform
	VSC VR501	VSC Set the amplitude of the complex waveform.
	V SET UP VR601	Ramp UP sets amplitude of the Top Ramp of the Drive Waveform
	V SET DN VR602	V Set Down sets the Pitch of the Bottom Ramp of the Drive Waveform
	15V	To the Control Board then routed to the Z-SUS board
Floating Ground	5V	Used on the Y-Drive boards

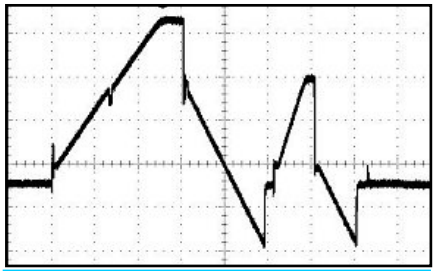
Y-SUS PWB Layout



Y-SUS PWB P207 Explained

Note: When the Y-Drive PWB is removed, use Pin 1 or 2 of P207 on the Y-SUS Board to check for the Y-Drive signal. You can also use the left side of C213.





P207 Pins 1 and 2
Y Drive Scan signal

5V measured from
Floating Gnd
Pins 8 and 9 P104
Pins 4 or 5 P207

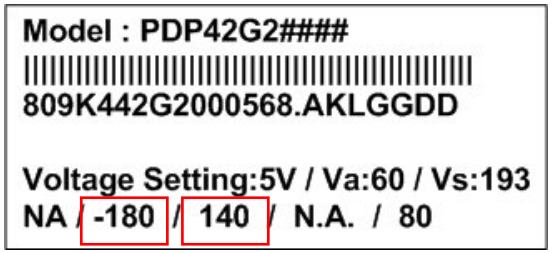
P207 Pins 7, 8, 9, 10 and 11
Logic (Drive) Signals to the
Y Drive PWB

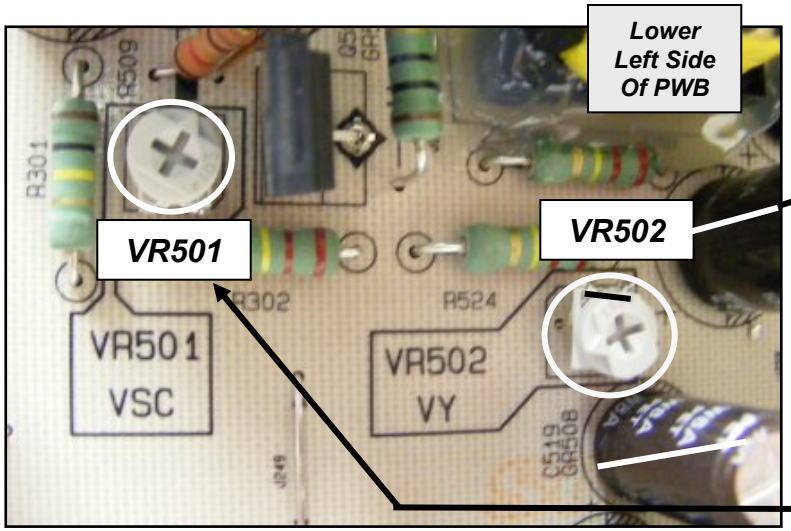
VSC and -VY Adjustments

CAUTION: Use the actual panel label and not the book for exact voltage settings.

Y SUSTAIN ADJUSTMENT DETAILS

These are DC level Voltage Adjustments

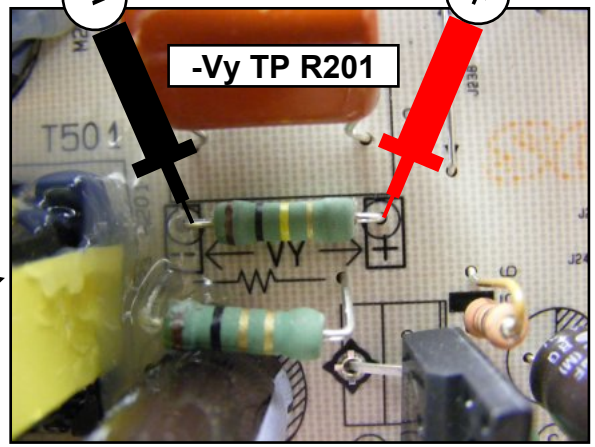




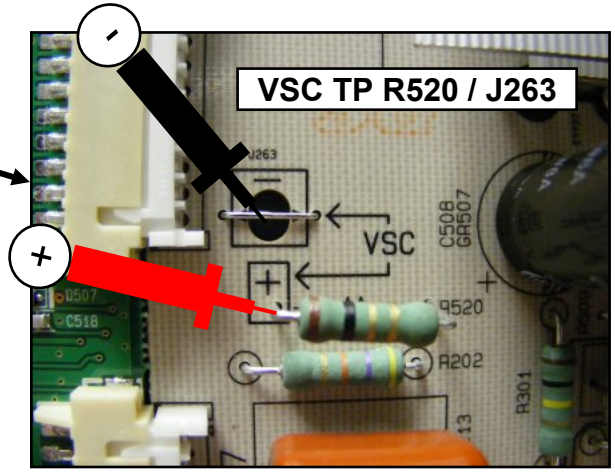
-Vy TP

Vsc TP

Voltage Reads Positive



Just below Heat Sinks



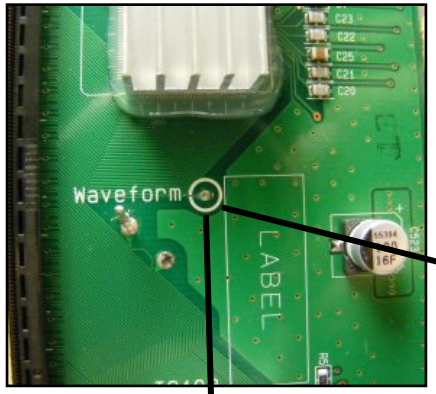
Lower Left Side of PWB

Set should run for 15 minutes, this is the "Heat Run" mode.
Set screen to "White Wash" mode or 100 IRE White input.

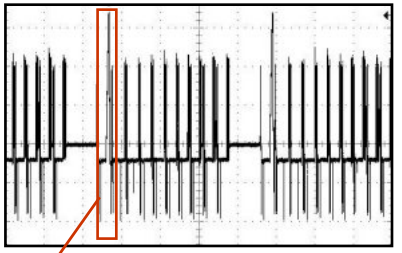
Adjust –Vy to Panel Label voltage (+/- 1V)
Adjust VSC to Panel Label voltage (+/- 1V)

Y-Drive Signal Overview

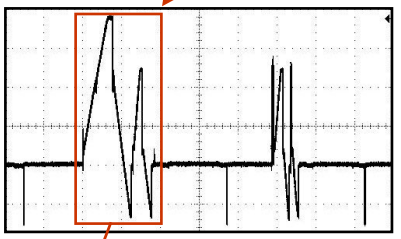
Y-Drive PWB Test Point (Top of Y-Drive Board)



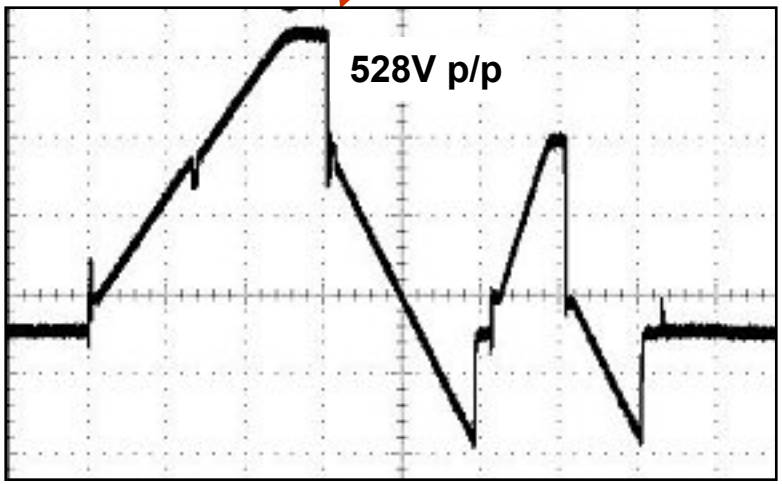
① Overall signal observed 4mS/div



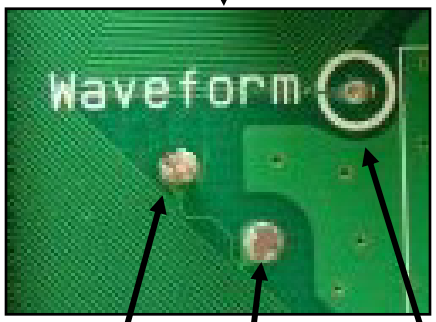
② Highlighted signal from waveform above observed 400uS/div



③ Highlighted signal from waveforms above observed 100uS/div



100uS



NOTE: The Waveform Test Point is fragile. If by accident the land is torn and the run lifted, make sure there are no lines left to right in the picture.
NOTE: The two test points just below and to the left will also work for the Y-Drive waveform Test Point.

Observing (Capturing) the Y-Drive Signal for Vsetup Ramp-Up (RAMP)

Set must be in “WHITE WASH” All other DC Voltage adjustments should have already been made.

Fig 1:
As an example of how to lock in to the Y-Drive Waveform. Fig 1 shows the signal locked in at 4ms per/div. Note the 2 blanking sections.
The signal for SET-UP is outlined within the Waveform

Fig 2:
At 2mSec per/division, the waveform to use for SET-UP Is now becoming clear.

Fig 3:
At 400us per/div. the signal for SET-UP is now easier to recognize. It is outlined within the Waveform

Fig 4:
At 40uSec per/division, the adjustment for SET-UP can be made.

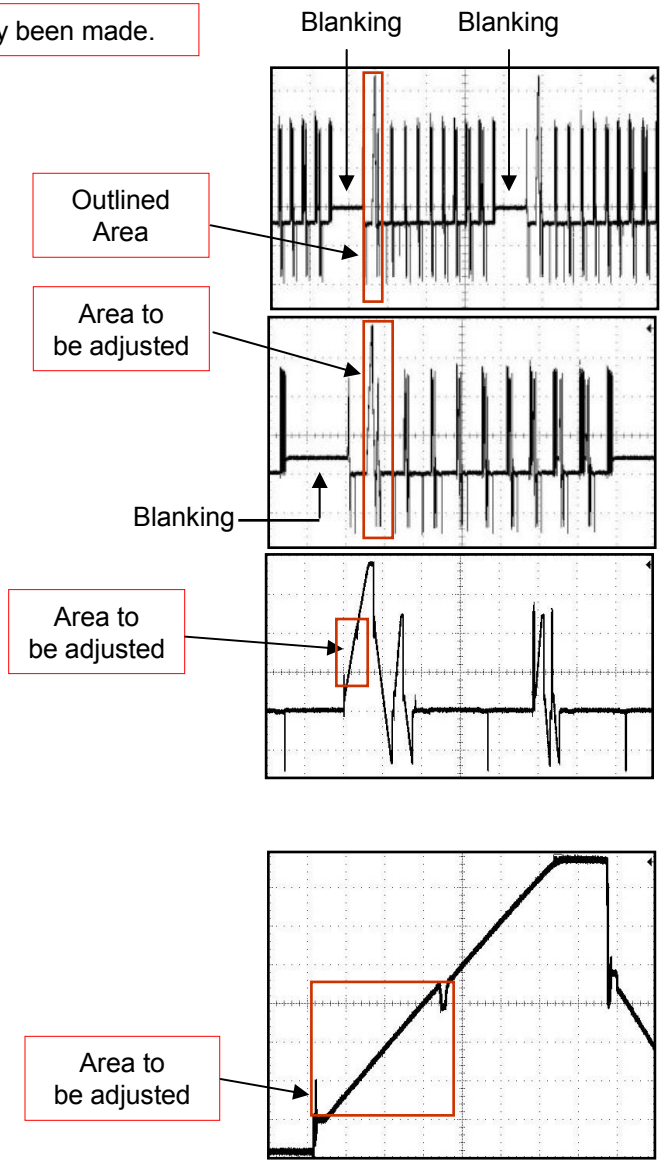


FIG1 4mS

FIG2 2mS

FIG3 400uS

FIG4 40uS

Observing (Capturing) the Y-Drive Signal for Vsetup Ramp-Down

Set must be in “WHITE WASH” All other DC Voltage adjustments should have already been made.

Fig 1:
As an example of how to lock in to the Y-Drive Waveform. Fig 1 shows the signal locked in at 4ms per/div. Note the 2 blanking sections.
The signal for SET-DN is outlined within the Waveform

Fig 2:
At 2mSec per/division, the waveform to use for SET-DN is now becoming clear.

Fig 3:
At 400us per/div. the signal for SET-DN is now easier to recognize. It is outlined within the Waveform

Fig 4:
At 40uSec per/division, the adjustment for SET-DN can be made.

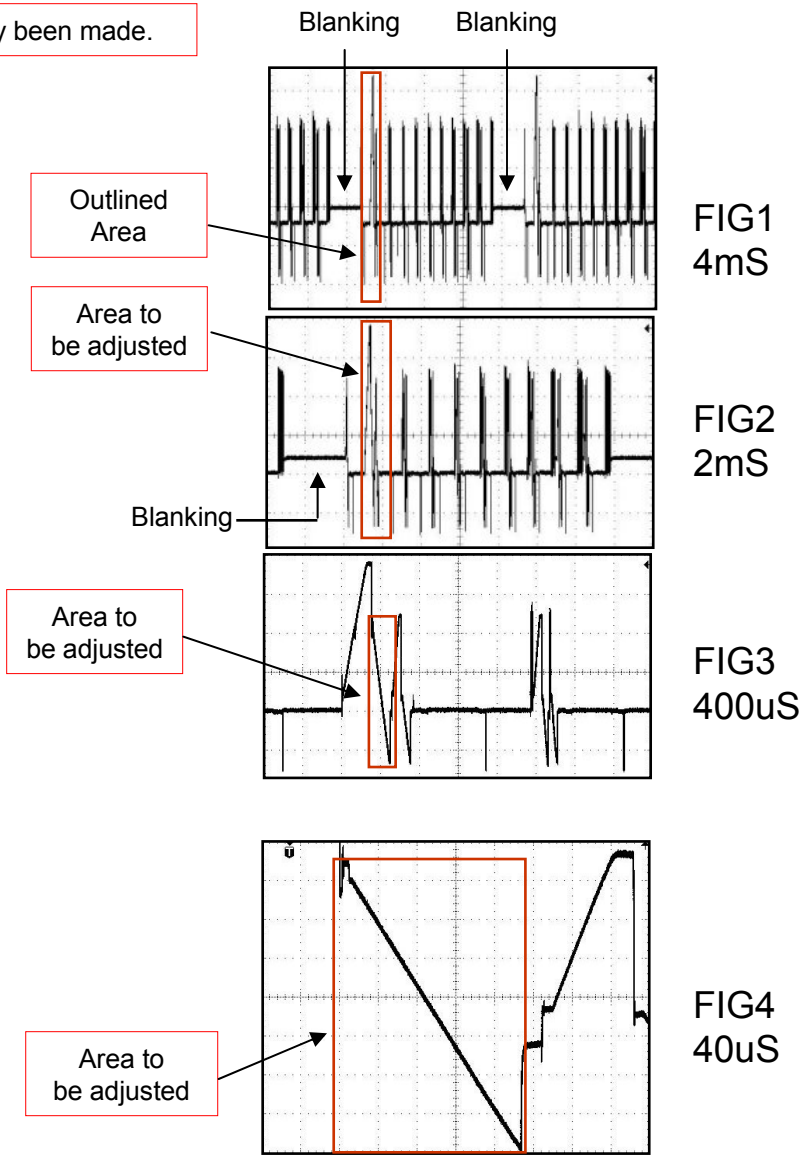


FIG1 4mS

FIG2 2mS

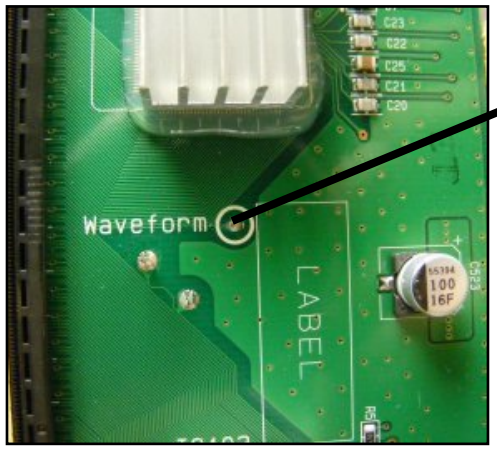
FIG3 400uS

FIG4 40uS

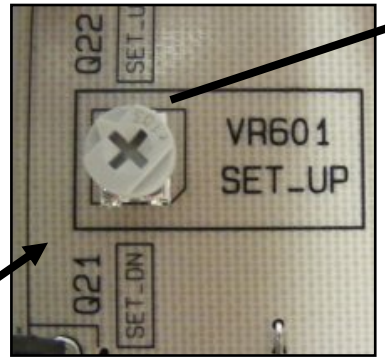
V-Set Up and V-Set Down Adjustments

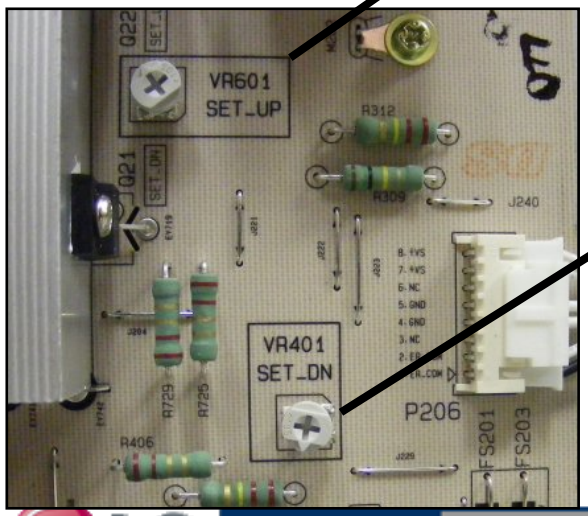
Y SUSTAIN ADJUSTMENT DETAILS (Vs, Va, VSC and –VY must have already been completed). Set in White Wash.

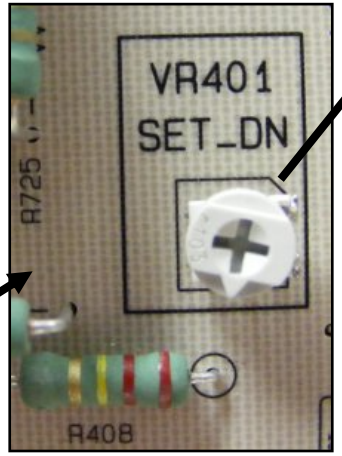
Observe the Picture while making these adjustments. Normally, they do not have to be done.

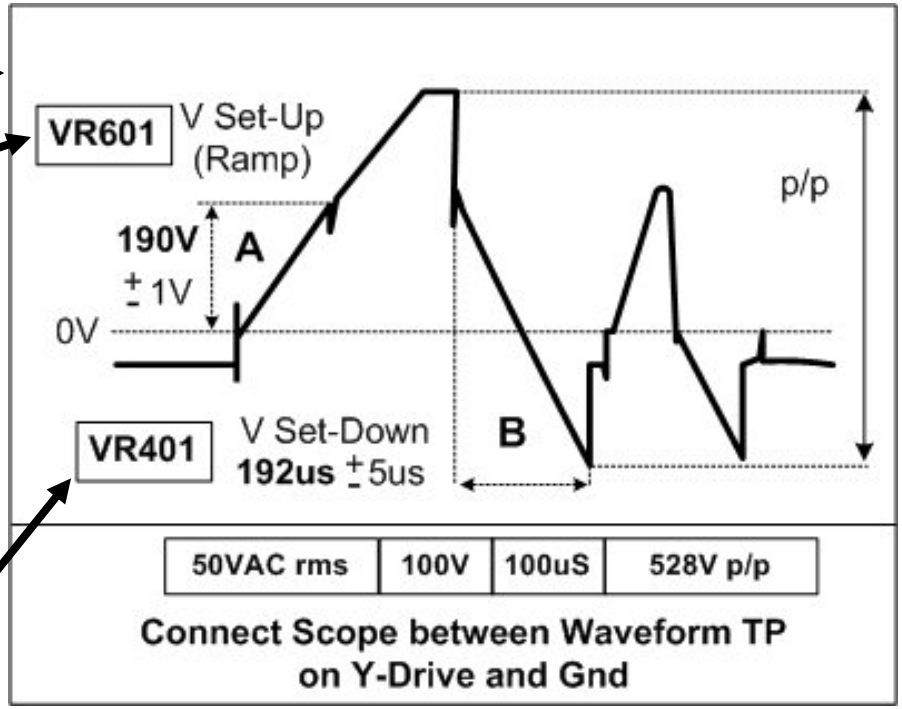


Y-Drive PWB Test Point



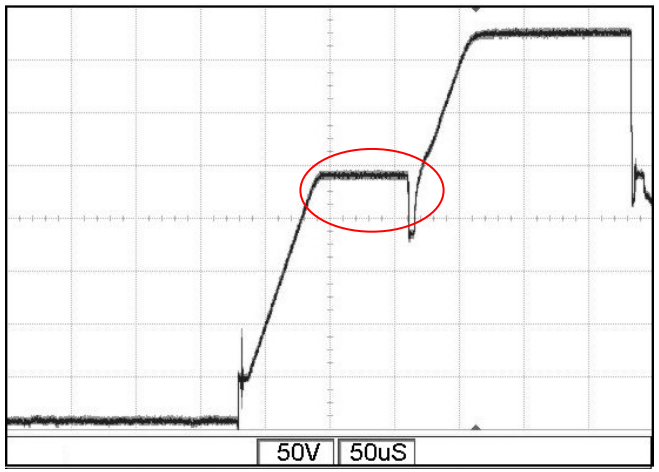




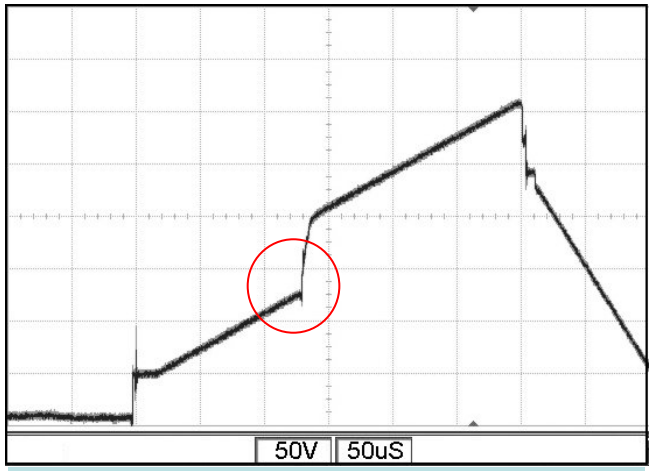


ADJUSTMENT LOCATION:
Just to the bottom right of the right hand heat sink.

V Set Up Too High or Low

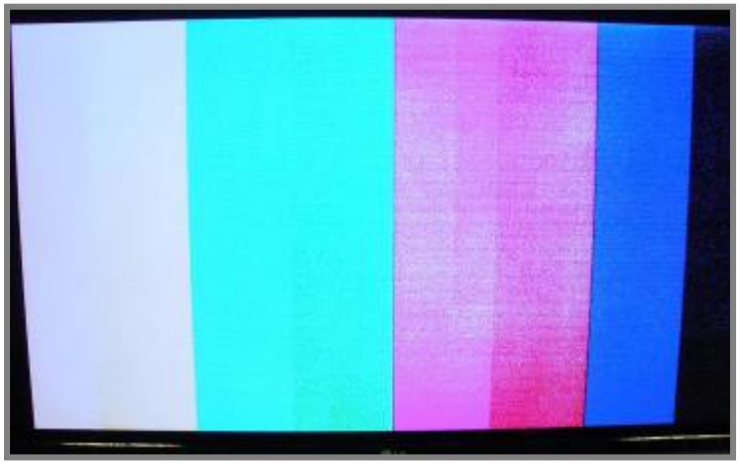


Ramp (Vset UP) too high

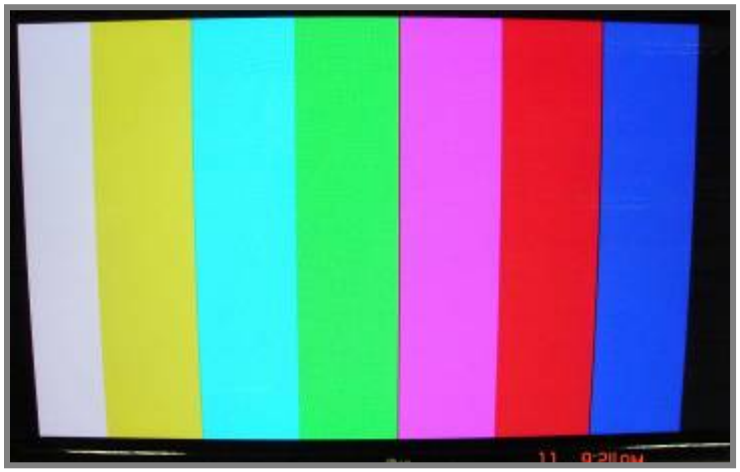


Ramp (Vset UP) too low

Panel Waveform Adjustment



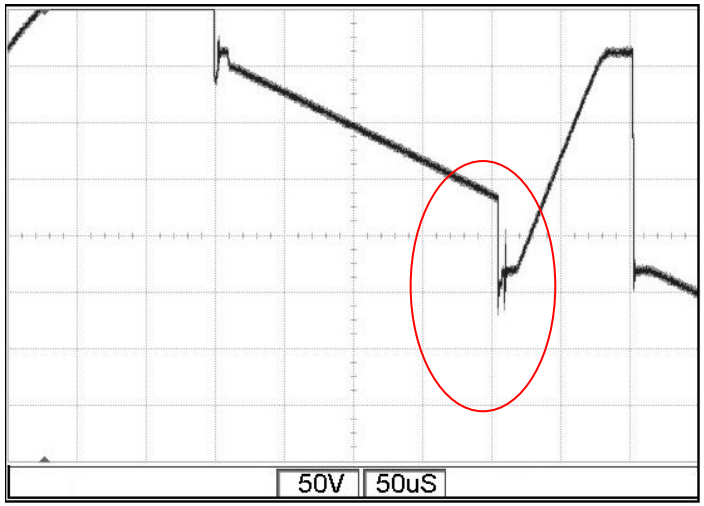
The center begins to wash out and arc due to **Vset UP** Peeking too late and alters the start of the **Vset DN** phase.



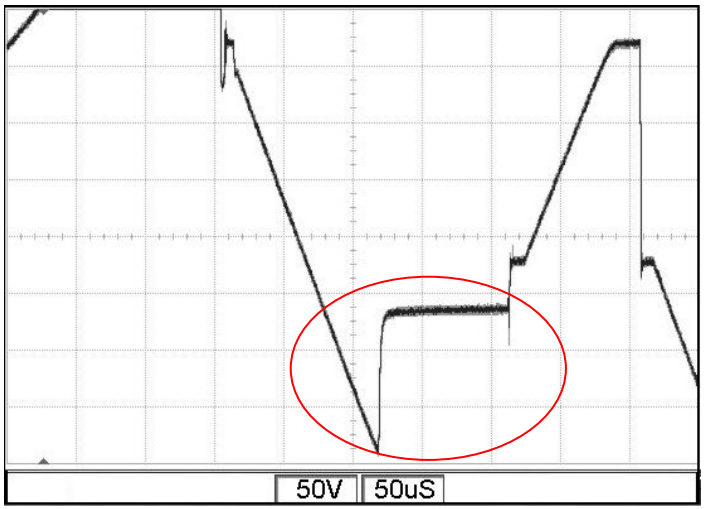
Very little alteration to the picture, the wave form indicates a distorted **Vset UP**. The peek widens due to the **Vset UP** peeking too quickly.

V Set Dn Too High or Low

Vset Dn swing is Minimum 110uS Max 200uS+

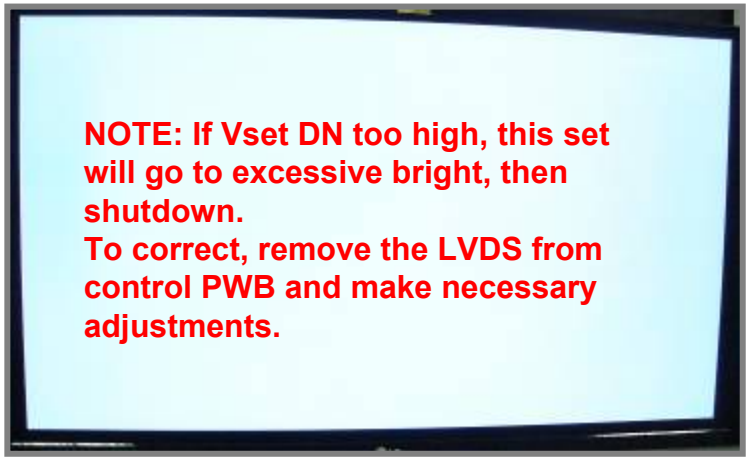


Vset DN too high

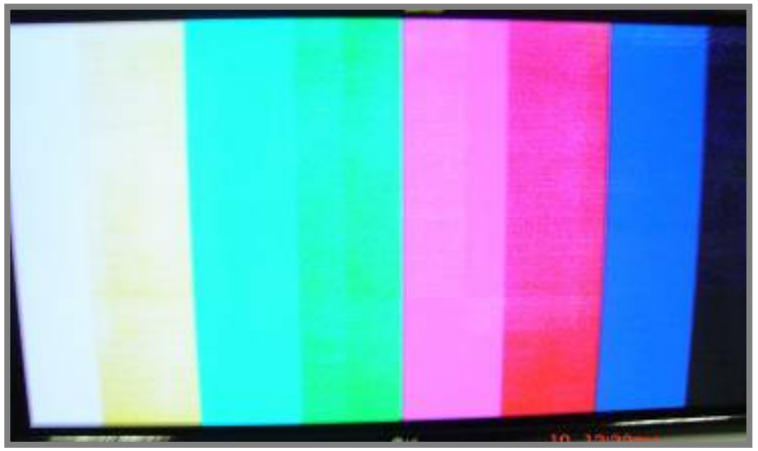


Vset DN too low

Panel Waveform Adjustment

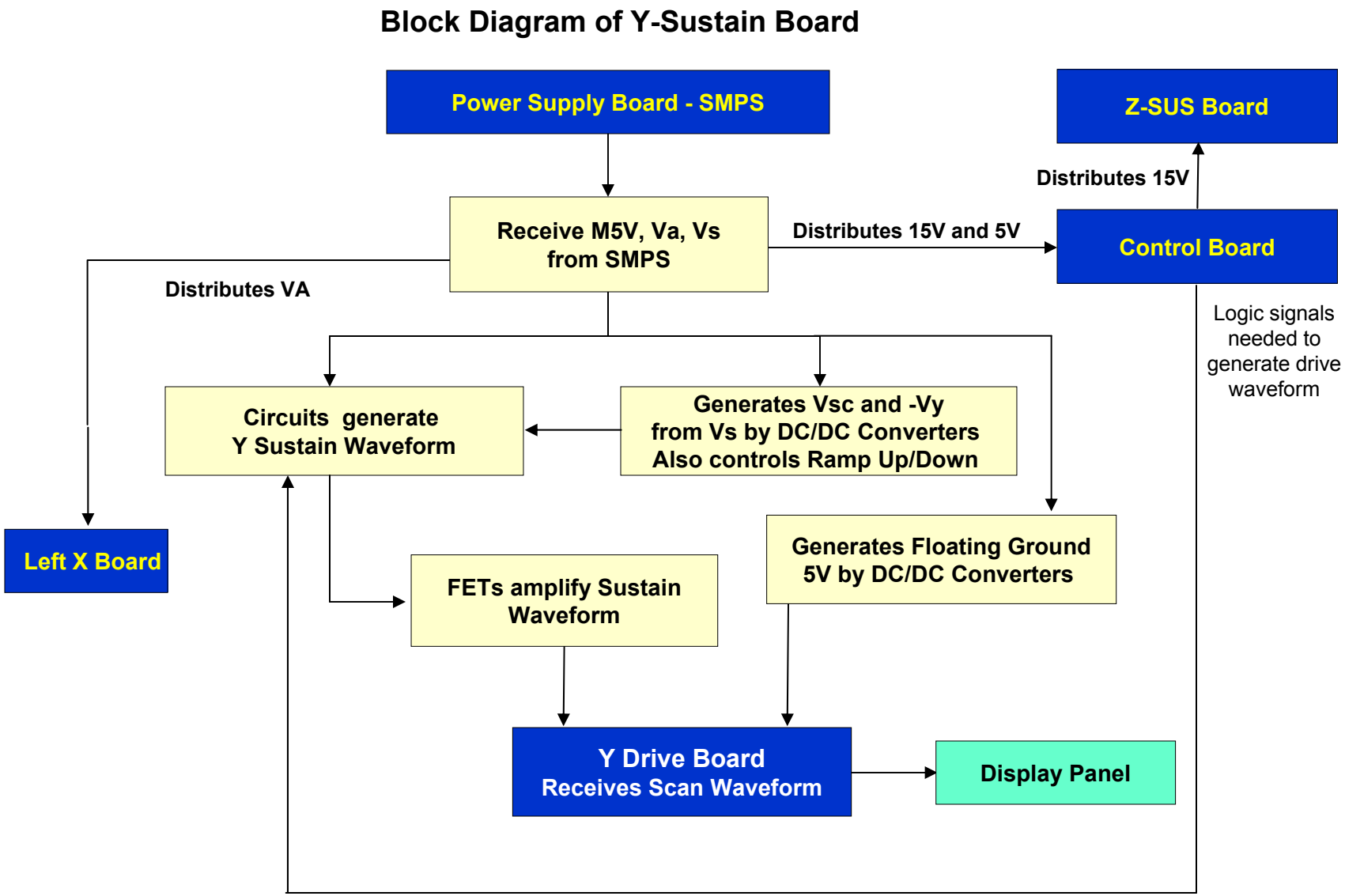


All of the center washes out due to increased **Vset_DN** time.



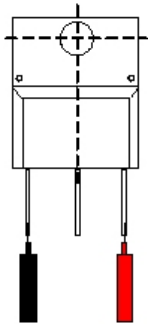
The center begins to wash out and arc due to decreased **Vset DN** time.

Y SUS Block Diagram



Y-SUS How to Check the Output FETs

Name is printed on the components. Readings "In Circuit".

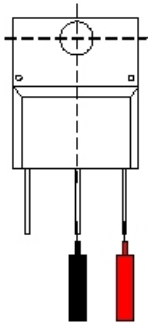


IRFP4332

Forward: 0.5V ~ 0.7V
Reverse: 1.1V

IRGP4086

Forward: 0.6V ~ 0.7V
Reverse: 1.3V

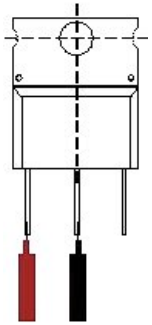


IRFP4332

Forward: 0.4V ~ 0.5V
Reverse: Open

IRGP4086

Forward: 0.39V ~ 0.5V
Reverse: Open

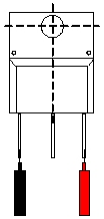


IRFP4332

Forward: 1.6V
Reverse: Open

IRGP4086

Forward: 0.6V ~ 0.7V
Reverse: 1.3V



RF2001

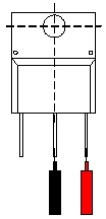
Forward: Shorted
Reverse: Shorted

30N45T

Forward: 0.6V
Reverse: Shorted

K3667

Forward: 0.22V
Reverse: Open



RF2001

Forward: 0.4V
Reverse: Open

30N45T

Forward: 0.6V
Reverse: Shorted

K3667

Forward: 0.5V
Reverse: Open

RF2001

Forward: 0.38V
Reverse: Open

IRGP4086

Forward: 0.39V ~ 0.5V
Reverse: Open

K3667

Forward: 0.4V ~ 0.5V
Reverse: Open

Y-SUS P201 to SMPS P812 Plug Information

Voltage and Resistance Measurement

P201 CONNECTOR "Y-SUS" to "Power Supply PWB" P811

Pin	Label	STBY	Run	Diode Mode
1	Vs	0V	*193V	Open
2	Vs	0V	*193V	Open
3	NC	NC	NC	NC
4	Gnd	Gnd	Gnd	Gnd
5	Gnd	Gnd	Gnd	Gnd
6	Va	0V	*60V	Open
7	Va	0V	*60V	Open
8	Gnd	Gnd	Gnd	Gnd
9	M5V	0V	5V	1.1V
10	M5V	0V	5V	1.1V

*** Note: This voltage will vary in accordance with Panel Label**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Y-SUS P202 to X Drive P211 and P311 Plug Information

Voltage and Diode Mode Measurements for the Y SUS Board

P202 CONNECTOR "Y-SUS PWB" to "X-Drive" Left P233

Pin	Label	STBY	Run	Diode Mode
1	Gnd	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd	Gnd
3	Gnd	Gnd	Gnd	Gnd
4	nc	nc	nc	nc
5	VA	0V	*60V	Open
6	VA	0V	*60V	Open
7	VA	0V	*60V	Open

*** Note: This voltage will vary in accordance with Panel Label**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Y-SUS P801 to Z Drive P1 Plug Information

Voltage and Diode Mode Measurements for the Y SUS Board

P206 Connector Y-SUS to Z Drive P1 Plug Information

Pin	Label	STBY	Run	Diode Mode
1	Er Com	0V	* 94.9V	Open
2	Er Com	0V	*94.9V	Open
3	nc	nc	nc	nc
4	Gnd	Gnd	Gnd	Gnd
5	Gnd	Gnd	Gnd	Gnd
6	nc	nc	nc	nc
7	VS	0V	*193V	Open
8	VS	0V	*193V	Gnd

*** Note: This voltage will vary in accordance with Panel Label**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

P101 Y-SUS to Control PWB P111 Plug Information

Voltage Measurements for the Y SUS Board

These connector pins are too close to read without possible damage to the PWB

Actually a 30 Pin Connector "Measurements can be made on the Control PWB

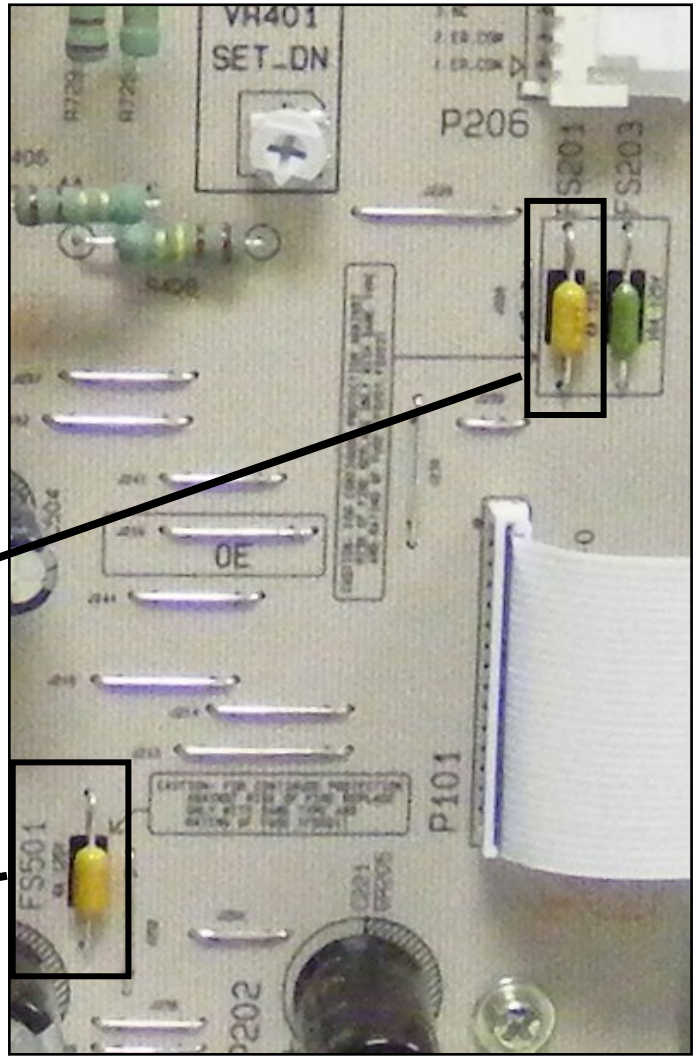
Y-SUS Board B+ checks for the P101 connector.

FS201
5V to run the Control Board.
Also sent to the Z-SUS Board.
Routed through the Control Board.
Leaves the Control Board on P101 pins 10.

Standby: 0V Run: 5V Diode Check: 1.1V

FS501
15V to run the Z-SUS Board.
Routed through the Control Board.
Leaves the Control Board on P101 pins 11 and 12.

Standby: 0V Run: 15V Diode Check: 0.78V



Y-SUS P101 to Control P111 Plug Information

Pin 1 on Y-SUS is Pin 30 on Control

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

"Y-SUS" P101 CONNECTOR to "Control PWB" P111

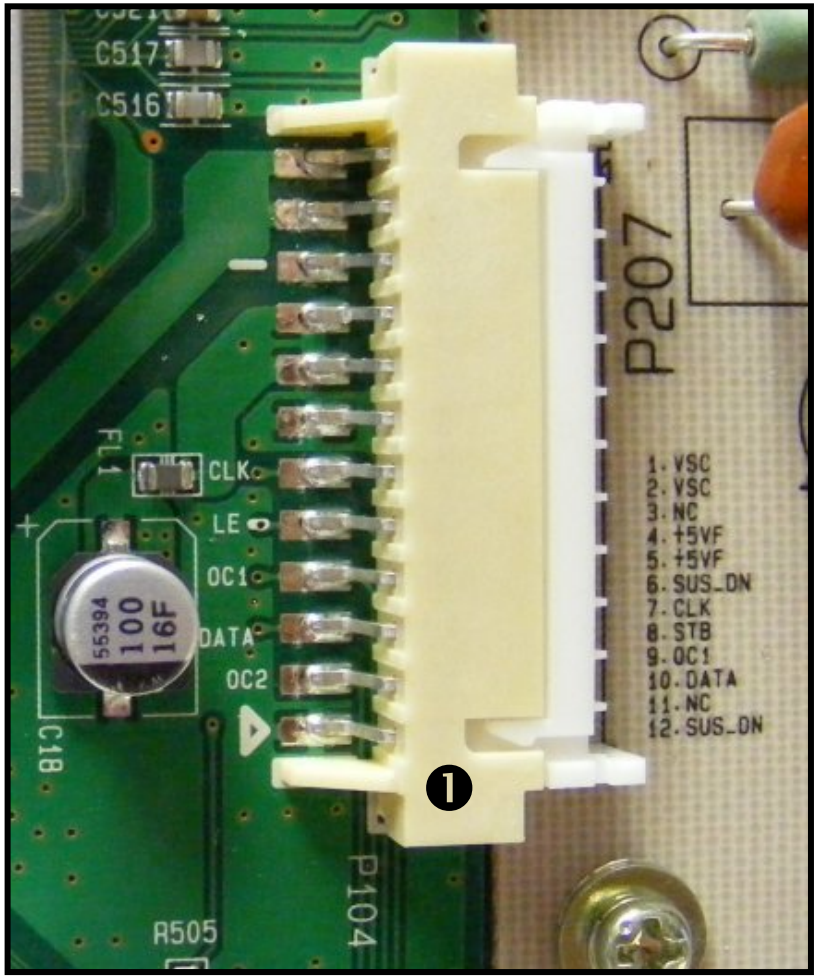
Pin	Label	STBY	Run	Diode Mode
1	Gnd	Gnd	0V	Gnd
3	CTRL_OE	0V	0.1V	0.65V
5	Dummy 4	0V	1.28V	0.65V
7	Dummy 3	0V	0V	0.65V
9	CLK	0V	0.6V	0.65V
11	STB	0V	2.96V	0.65V
13	BLK	0V	1.4V	0.65V
15	Data	0V	0V	0.65V
17	OC2	0V	1.89V	0.65V
19	Dummy 2	0V	2.16V	0.65V
21	Gnd	Gnd	Gnd	Gnd
23	Gnd	Gnd	Gnd	Gnd
25	5V	0V	5V	0.44V
27	5V	0V	5V	0.44V
29	15V	0V	15V	Open

Pin	Label	STBY	Run	Diode Mode
2	SET_DN	0V	0.12V	0.65V
4	SUS_UP	0V	0.13V	0.65V
6	ER_UP	0V	0.2V	0.65V
8	Dummy 1	0V	1.05V	0.65V
10	Dummy 5	0V	0.17V	0.65V
12	Set_Up	0V	2.5V	0.65V
14	ER_DN	0V	0V	0.65V
16	SUS-DN	0V	0V	0.65V
18	OE	0V	0V	Open
20	Gnd	Gnd	Gnd	Gnd
22	Gnd	Gnd	Gnd	Gnd
24	5V	0V	5V	0.44V
26	5V	0V	5V	0.44V
28	5V	0V	5V	0.44V
30	15V	0V	15V	Open

Y-SUS P207 Voltage Readings

All voltages taken from Floating Ground.

Warning: Do not hook scope ground up unless set plugged into an isolation transformer.

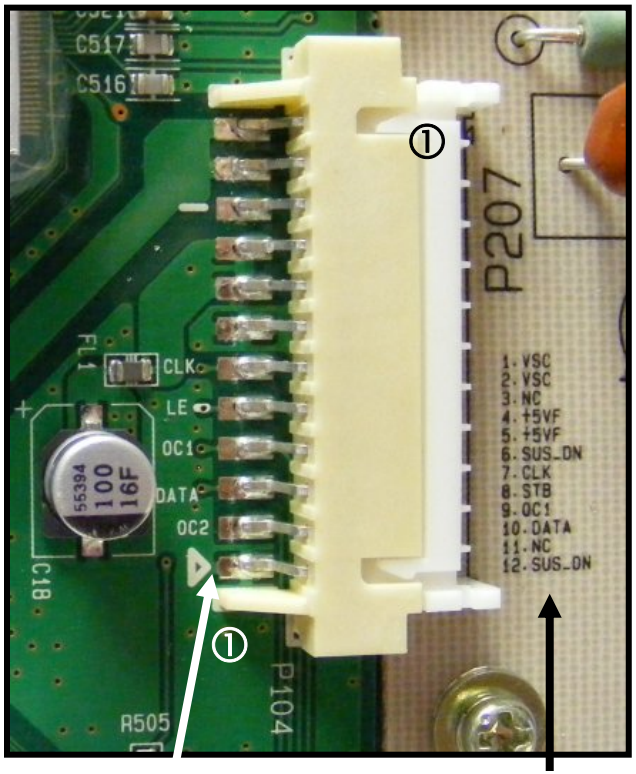


P207		
Pin	Label	Voltage
1)	VSC	140V
2)	VSC	140V
3)	Nc	
4)	5V VF	5V
5)	5V VF	5V
6)	SUS_DN	FGnd
7)	CLK	0.96V
8)	STB	2.3V
9)	OC1	2.3V
10)	DATA	0V
11)	Nc	
12)	SUS_DN	FGnd

Y-SUS P207 (Drive Output Plug) TESTING

P104 OF THE Y-DRIVE PWB

P207 OF THE Y-DRIVE PWB



Pin 1

Floating Ground

Pin 1 on Y-SUS is backwards compared to Y-Drive

CHECKING THE Y-SUS PWB
Disconnected from the Y-DRIVE PWB

Readings from Floating Ground (Pin 1)

		RED LEAD Blk Lead FG	BLACK LEAD Red Lead FG
Y Drive Sig	1.) VSC	Open	Open
Y Drive Sig	2.) VSC	Open	Open
	3.) nc	Open	Open
	4.) FG+5V	1.78V	0.52V
	5.) FG+5V	1.78V	0.52V
Floating Gnd	6.) SUS Dn	0V	0V
	7.) CLK	1.57V	0.59V
	8.) LE	1.57V	0.59V
	9.) OC1	1.67V	0.63V
	10.) Data	1.57V	0.59V
	11.) nc	1.67V	0.65V
Floating Gnd	12.) SUS Dn	0V	0V

Meter in the Diode Mode

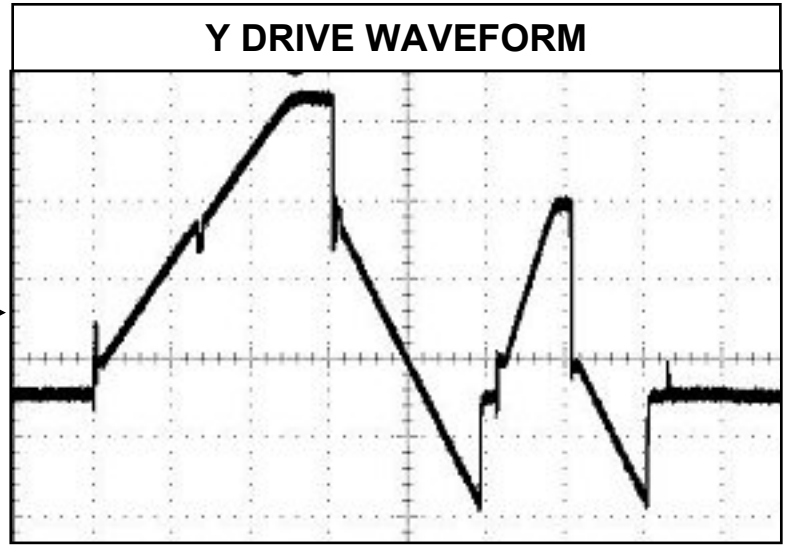
Y-DRIVE PWB SECTION (Y-Drive Explained)

Y-Drive Board works as a path supplying the Sustain and Reset waveforms which are made in the Y SUSTAIN PWB and sent to the Panel through SCAN DRIVER IC's.

The Y Drive Boards supply a waveform which selects the horizontal electrodes sequentially.

* 42PQ20 uses 8 DRIVER ICs on 1 Y Drive Board

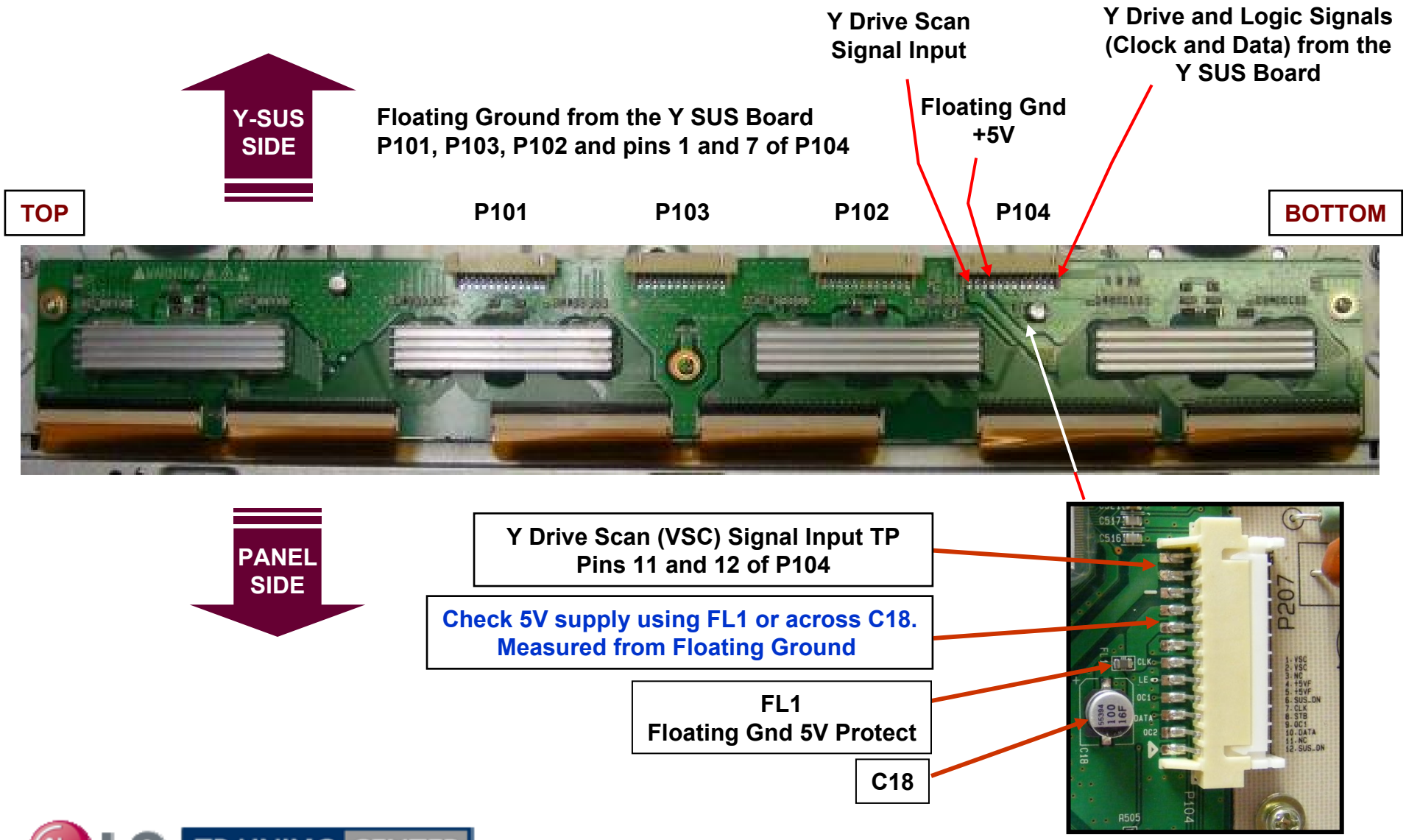
Y DRIVE WAVEFORM TEST POINT



To facilitate scope attachment, solder a small wire (Stand Off) at this point.

Y Drive PWB ID

5 Volts, Y Drive and Logic Signals from Y SUS Board are supplied to the Drive Board on Connectors P104.

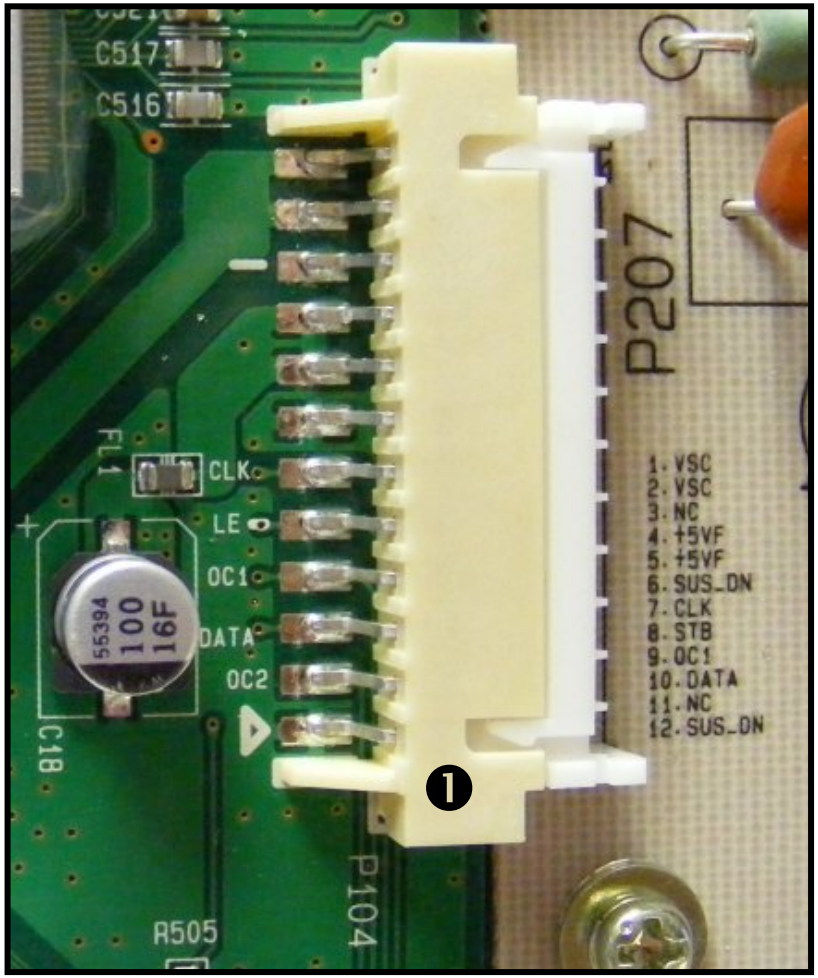


Y Drive P104 Voltage Readings

All voltages taken from Floating Ground.
Warning: Do not hook scope ground up unless set plugged into an isolation transformer.

P104

Pin	Label	Voltage
12)	VSC	140V
11)	VSC	140V
10)	Nc	
9)	5V VF	5V
8)	5V VF	5V
7)	SUS_DN	FGnd
6)	CLK	0.96V
5)	LE	2.3V
4)	OC1	2.3V
3)	DATA	0V
2)	Nc	
1)	SUS_DN	FGnd



P207

Pin	Label	Voltage
1)	VSC	140V
2)	VSC	140V
3)	Nc	
4)	5V VF	5V
5)	5V VF	5V
6)	SUS_DN	FGnd
7)	CLK	0.96V
8)	STB	2.3V
9)	OC1	2.3V
10)	DATA	0V
11)	Nc	
12)	SUS_DN	FGnd

Y-Drive PWB Buffer Troubleshooting

CHECKING THE Y-DRIVE PWB
Disconnected from the Y-SUS PWB

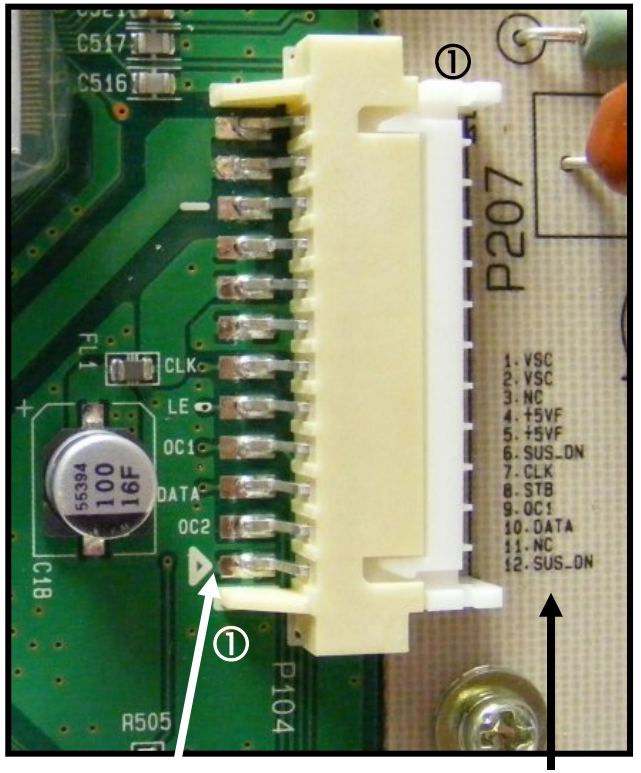
Readings from Floating Ground (Pin 1)

		RED LEAD Blk Lead FG	BLACK LEAD Red Lead FG
Y Drive Sig	12.) VSC	1.15V	Open
Y Drive Sig	11.) VSC	1.15V	Open
	10.) nc	Open	Open
	9.) FG+5V	0.4V	Open
	8.) FG+5V	0.4V	Open
Floating Gnd	7.) SUS Dn	0V	0V
	6.) CLK	0.5V	2.9V
	5.) LE	0.5V	2.9V
	4.) OC1	0.5V	Open
	3.) Data	0.62V	Open
	2.) nc	0.48V	Open
Floating Gnd	1.) SUS Dn	0V	0V

Meter in the Diode Mode

P104 OF THE Y-DRIVE PWB

P207 OF THE Y-DRIVE PWB



Pin 1

Floating Ground

Pin 1 on Y-SUS is backwards compared to Y-Drive

Removing (Panel) Flexible Ribbon from Y Drive

Flexible Ribbon Cables shown are from a different model, but process is the same.

To remove the Ribbon Cable from the connector first carefully lift the Locking Tab from the back and tilt it forward (lift from under the tab as shown in Fig 1).
The locking tab must be standing straight up as shown in Fig 2.
Lift up the entire Ribbon Cable gently to release the Tabs on each end. (See Fig 3)
Gently slide the Ribbon Cable free from the connector.

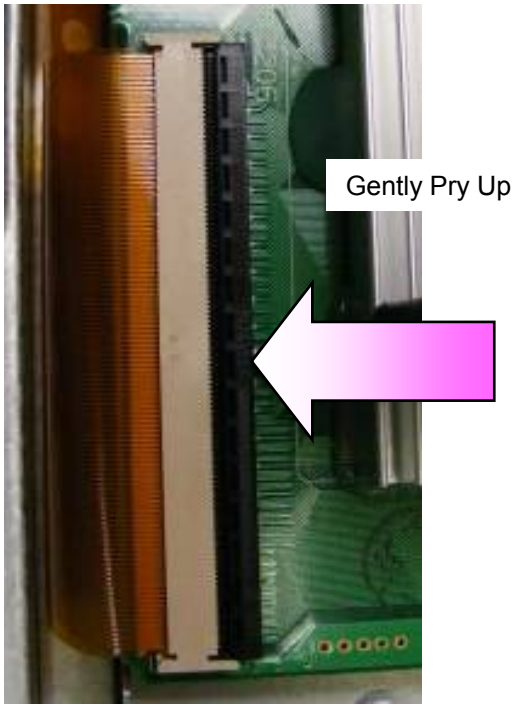


Fig 1

Fig 2

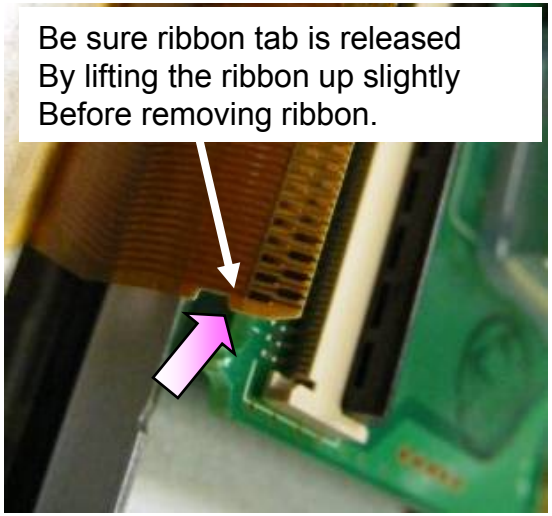


Fig 3

To reinstall the Ribbon Cable, carefully slide it back into the slot see (Fig 3), be sure the Tab is seated securely and press the Locking Tab back to the locked position see (Fig 2 then Fig 1).

Y Drive Flexible Ribbon Incorrectly Seated

The Ribbon Cable is clearly improperly seated into the connector. You can tell by observing the linearity.

The Locking Tab will offer a greater resistance to closing in the case.

Note the cable is crooked. In this case the Tab on the Ribbon cable was improperly seated at the top. This can cause bars, lines, intermittent lines abnormalities in the picture.

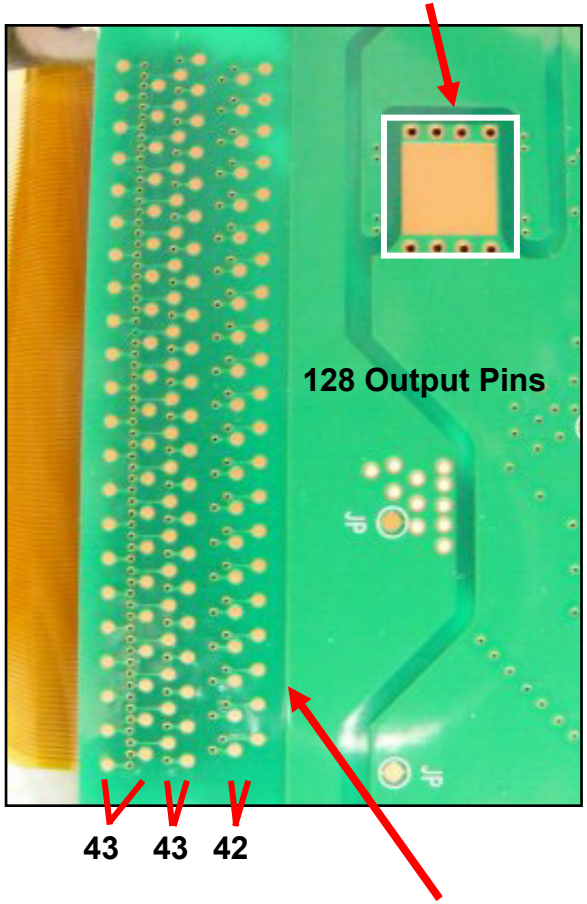
Remove the ribbon cable and re-seat it correctly.

Y Drive BUFFER Troubleshooting

YOU CAN CHECK ALL 8 BUFFER ICs USING THIS PROCEDURE

BACK SIDE OF Y-DRIVE PWB

BUFFER IC FLOATING GROUND (FGnd)



- **Any of these output lugs can be tested.**
- **Look for shorts indicating a defective Buffer IC**

Using the "Diode Test" on the DVM, check the pins for shorts or abnormal loads.

RED LEAD ON BUFFER IC FGnd

Indicated by white outline

BLACK LEAD ON "ANY" OUTPUT LUG. READING 0.78 V

BLACK LEAD ON BUFFER IC FGnd

Indicated by white outline

RED LEAD ON "ANY" OUTPUT LUG. READING "OPEN"

128 Output Pins per/buffer

6 Ribbon cables (Horizontal Grids)

768 Total Horizontal Grids controlling Vertical resolution

Troubleshooting the Z-SUS Drive section of the Y-SUS PWB

This Section of the Presentation will cover troubleshooting the Z-Drive section of the Y-Z-SUS Board Assembly. Upon completion of this section the Technician will have a better understanding of the circuit and be able to locate voltage and resistance test points needed for troubleshooting and alignment.

Locations

- DC Voltage and Waveform Test Points
- Z BIAS Alignment
- Resistance Test Points

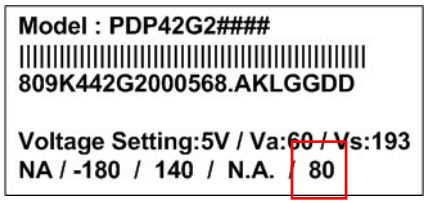
Operating Voltages

Y SUS Supplied	VS
	5V Vcc
	15V
Developed on Y SUS	Z Bias

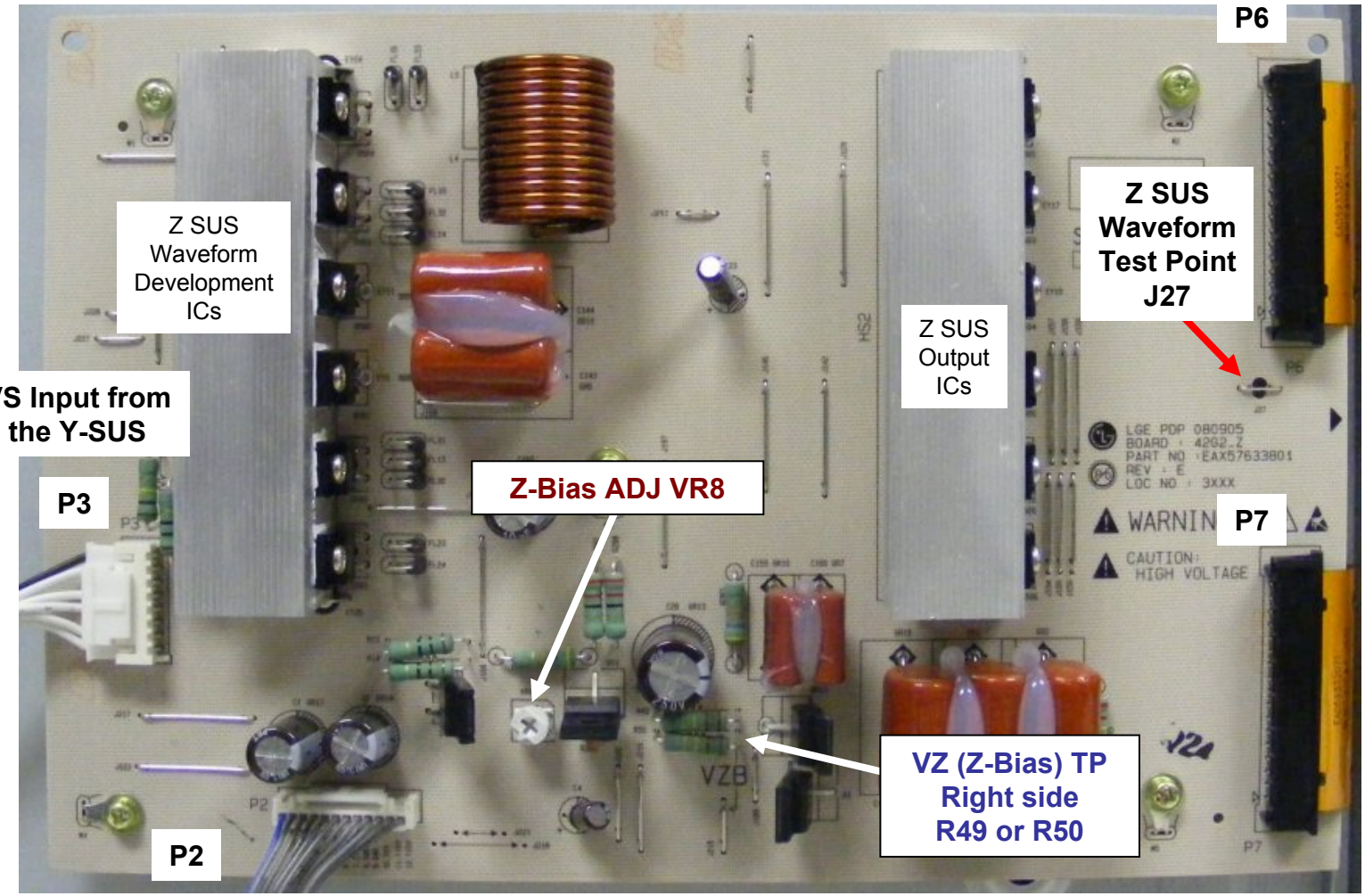
Z-SUS Board Layout

No IPMs

Read the Label on the back of the upper left hand side of the panel.



Z Bias



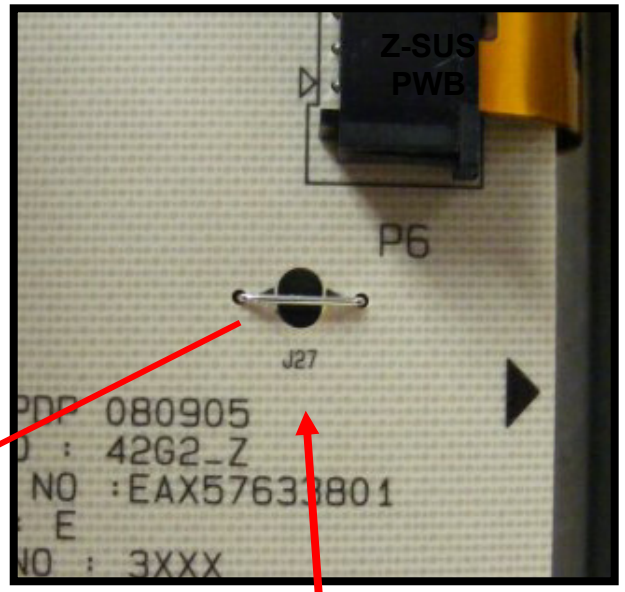
Logic Signals from the Control PWB
Also +15V and +5V

Z-SUS Waveform

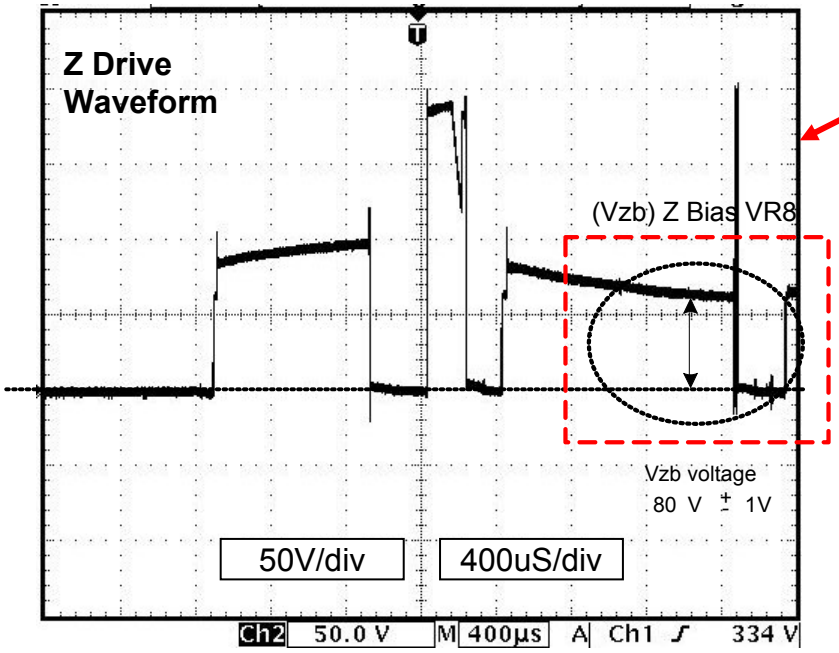
Provides the SUSTAIN PULSE and ERASE PULSE for generating SUSTAIN discharge in the panel by receiving Drive signals from the Y-Z-SUS PWB.

This waveform is supplied to the panel through FPC (Flexible Printed Circuit).

Z-Bias is a "DC" adjustment.
The effects of this adjustment can be observed on the scope looking at the Z-SUS output.



Oscilloscope Connection Point.
J27 to check Z Output waveform.
Right Hand side Center.



Note: The Vzb Adjustment is a DC level adjustment

This Waveform is just for reference to observe the effects of Zbz adjustment

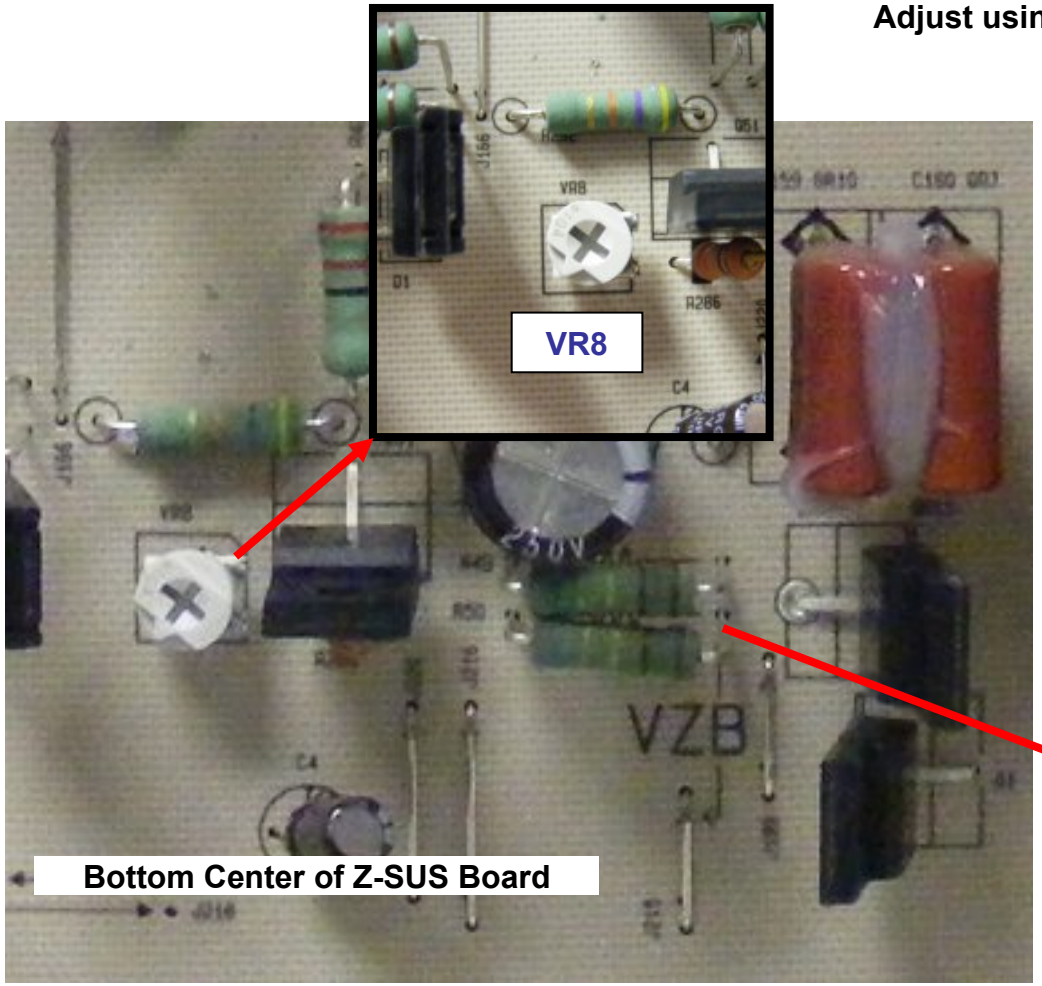
VZ (Z-Bias) Adjustment

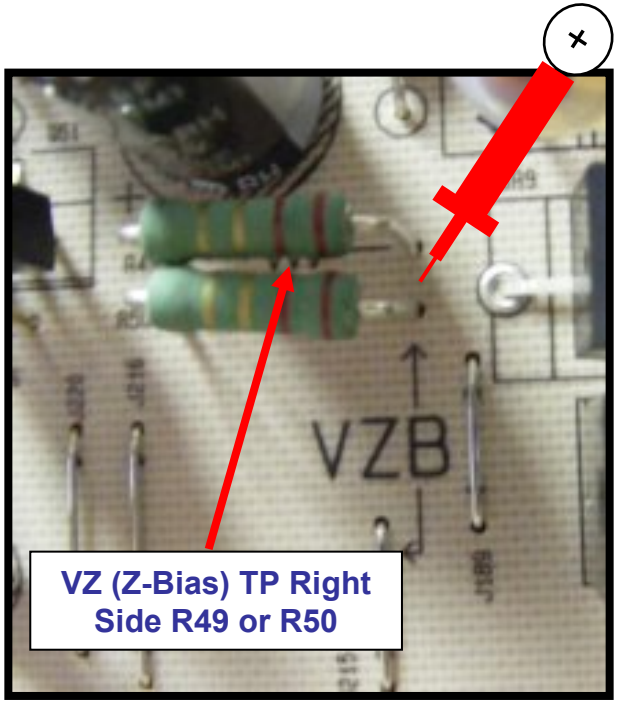
Read the Label on the back of the upper left hand side of the panel. Adjust using VR8.

Model : PDP42G2####
809K442G2000568.AKLGGDD

Voltage Setting:5V / Va:60 / Vs:193
NA / -180 / 140 / N.A. / 80

Z Bias



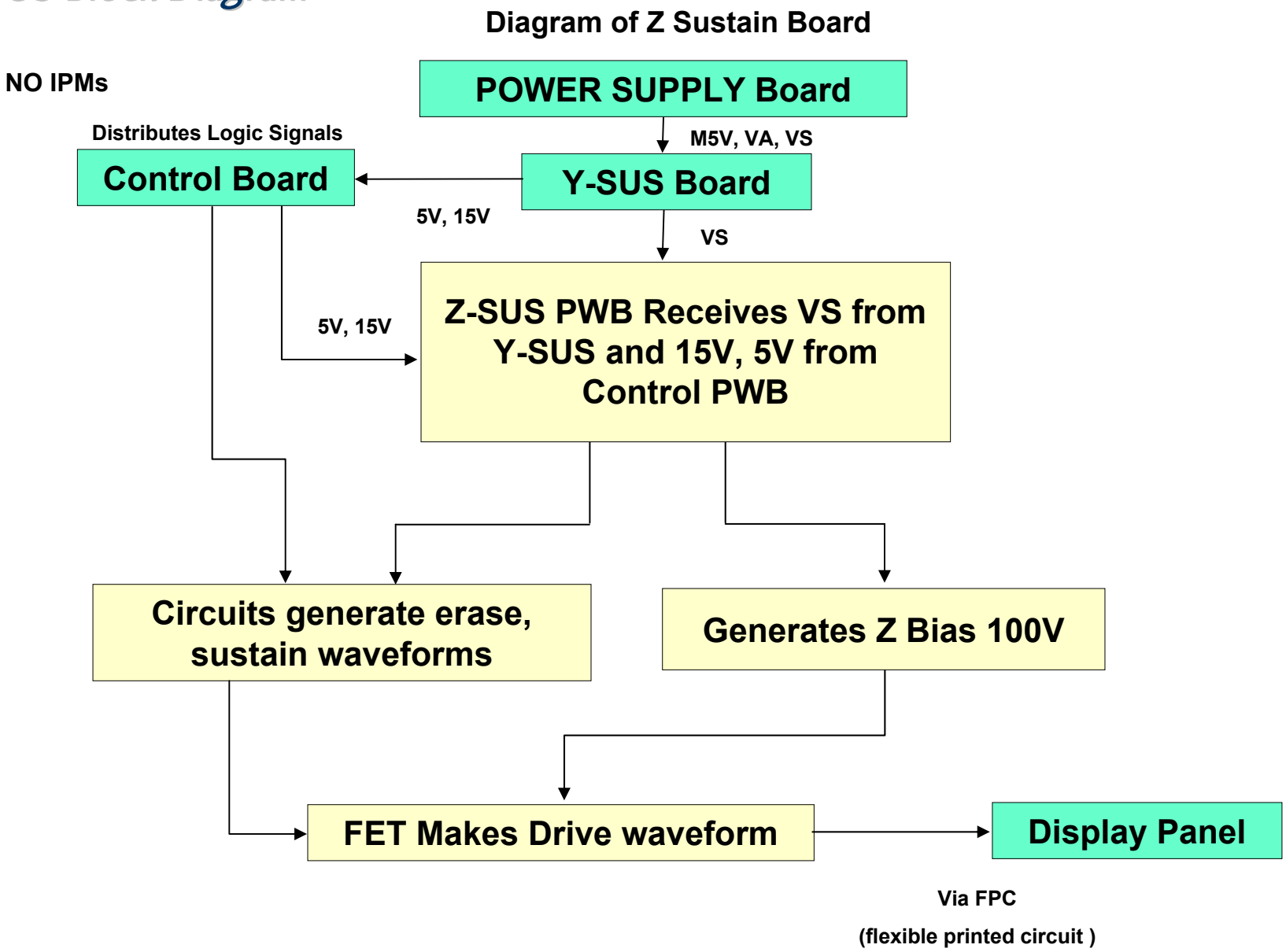


Measured from Chassis Ground

Set should run for 15 minutes, this is the "Heat Run" mode.
Set screen to "White Wash" mode or 100 IRE White input.

Adjust VZ (Z-Bias) to Panel Label (± 1V)

Z SUS Block Diagram



Z-SUS P3 Connector to Y-SUS P206 Voltages and Resistance

Voltage and Diode Mode Measurements

P3 CONNECTOR "Z-SUS PWB" to "Y-SUS Out" P206

Pin	Label	STBY	Run	Diode Mode
1	ER COM	0V	*94.9V	Open
2	ER COM	0V	*94.9V	Open
3	nc	nc	nc	Open
4	Gnd	Gnd	Gnd	Gnd
5	Gnd	Gnd	Gnd	Gnd
6	nc	nc	nc	Open
7	VS	0V	*193V	Open
8	VS	0V	*193V	Open

*** Note: This voltage will vary in accordance with Panel Label**

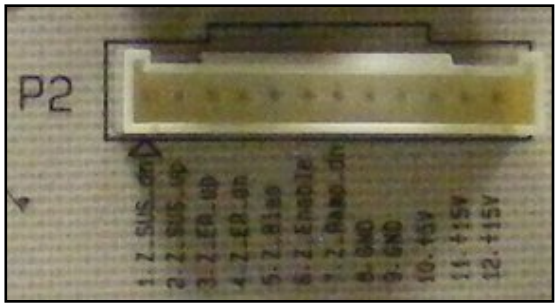
Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Z-SUS P2 Connector to Control P101 Voltages and Resistance

Voltage and Diode Mode Measurements

P2 CONNECTOR "Z-SUS PWB" to "Control" P101

Pin	Label	STBY	Run	Diode Mode
1	Z SUS DN	0V	0.79V	1.9V
2	Z SUS UP	0V	0.13V	1.9V
3	Z ER UP	0V	0.19V	1.9V
4	Z ER DN	0V	0.4V	1.9V
5	Z BIAS	0V	1.9V	1.9V
6	Z ENABLE	0V	0.8V	Open
7	Z RAMP DN	0V	1.9V	Open
8	Gnd	Gnd	Gnd	Gnd
9	Gnd	Gnd	Gnd	Gnd
10	+5V	0V	4.9V	Open
11	+15V	0V	16.9V	Open
12	+15V	0V	16.9V	Open



Pin 1 on the Left

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

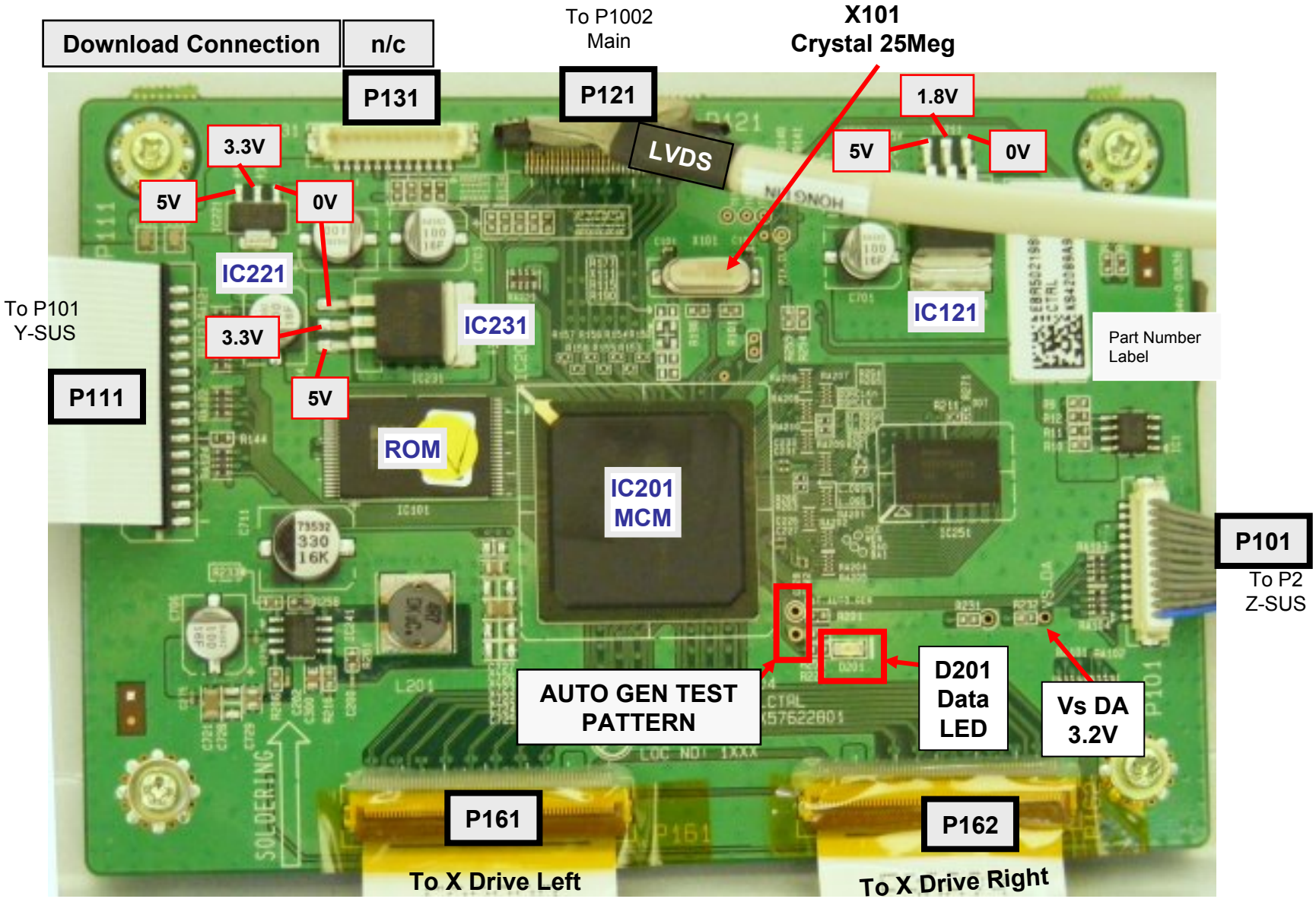
CONTROL PWB SECTION

This Section of the Presentation will cover troubleshooting the Control Board Assembly. Upon completion of this section the Technician will have a better understanding of the circuit and be able to locate voltage and resistance test points needed for troubleshooting.

- DC Voltage and Waveform Test Points
- Resistance Test Points

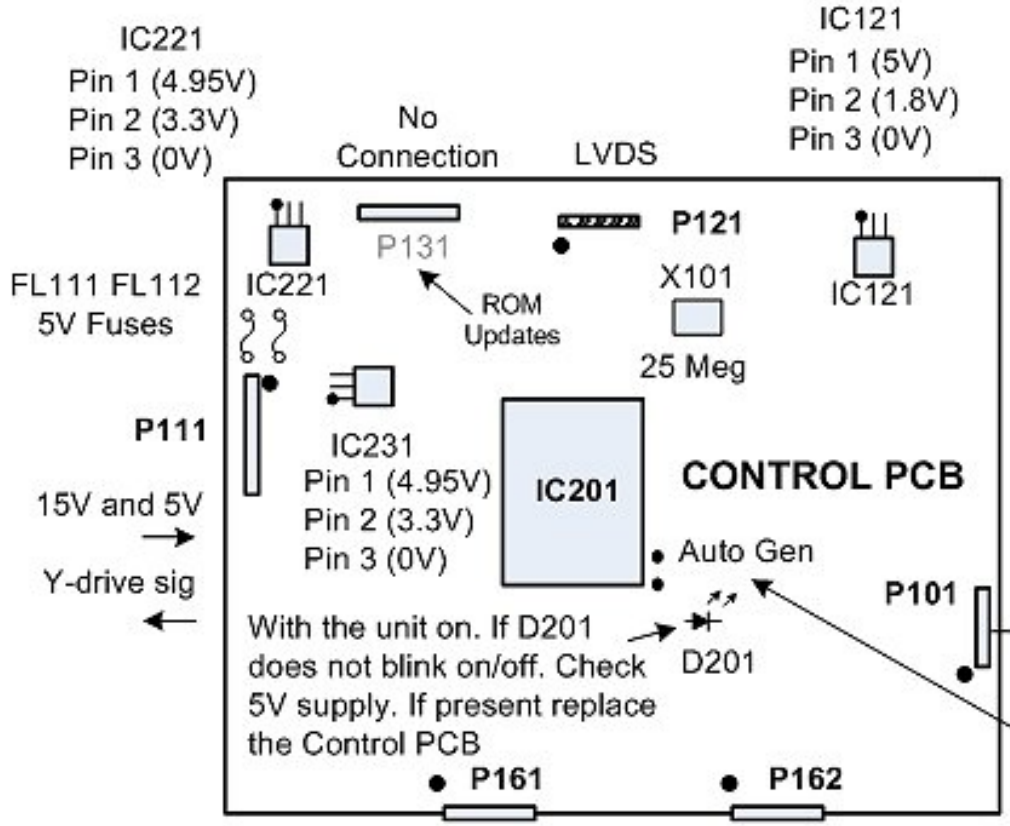
Signals	Main Board Supplied	LVDS Signal
Operating Voltages	Y SUS Supplied	+5V (Also Routed to the Z-SUS)
		+15V (Routed to the Z-SUS)
	Developed on the Control board	+1.8V
		(2) +3.3V

Control PWB Identified



Circuit Interconnect Blowup Control Board Section

Note: ***Pins 9 & 10 of connector P813 on the SMPS, if the supply is working, should have 5V which under normal operation supplies the Control Board with 5V via the Y SUS Board. By using 5V STB, the following test will confirm Normal operation of the Control Board if that supply is missing.***



Unplug all connectors. Jump 5V from SMPS (P813 pins 9~12) to pin 1 of IC121. Observe LED. If it blinks, most likely Control PWB is OK. FL111 and FL112 should be checked.

Disconnect P201 from the Y SUS Board and connect a Jumper from Pin 10 of P812 (M5V) to Pin 10 P201 (5V). The 5V will be routed to the Control Board via FS201, Ribbon Cable P101 on the Y SUS Board and FL111 and FL112 on the Control Board for Control Board operation verification.

15V and 5V to Z-SUS
Z-drive signals

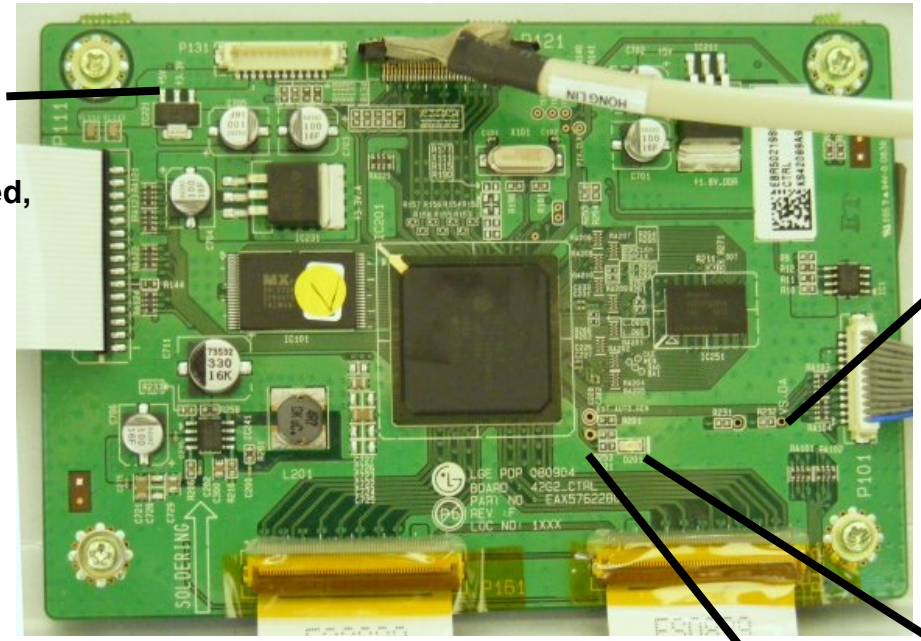
Short across the two points labeled Auto Gen to generate a test pattern.

If the complaint is no video and shorting the points (AutoGen) causes video to appear suspect the Digital PCB.

Control PWB Testing

For quick PWB test.
(All PWB connectors Disconnected).

Jump 5V from Power Supply to IC221 Pin 1.
If the LED blinks,
Pretty much guaranteed,
PWB is OK.

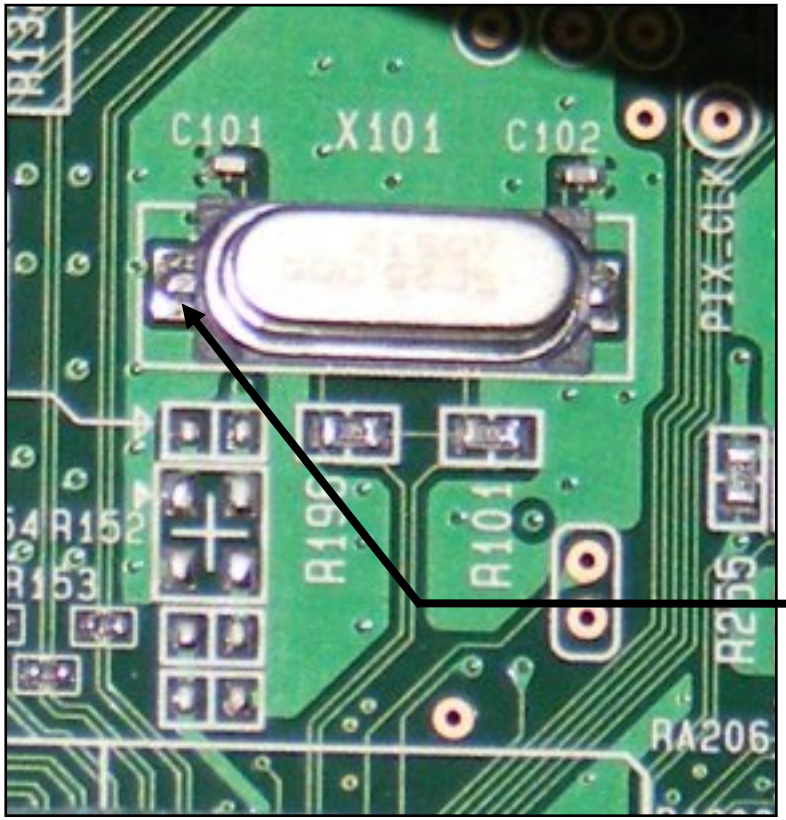


Confirm B+ to Control PWB
VS_DA
Control PWB Check
3V ~ 3.3V

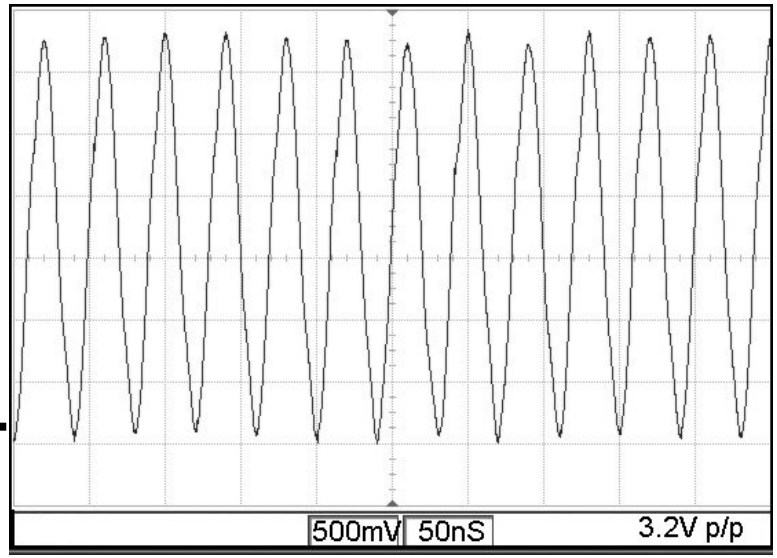
Quick observation
Of LED blinking
Tell if the Control
Board is running.

When the Television has a problem related to;
1) Shutdown caused by Main PWB
2) No Picture
This can be checked by the following.
(1) Disconnect the Main PWB from all connectors. Apply AC power.
Since P813 is not connected, the set will come on. Short the two pins on the Auto Test Pattern lands.
If there is a picture of cycling colors, the Y-SUS, Y-Drive, Z-SUS, Power Supply,
Control PWBs and Panel are all OK.
Same test for (2) to tell if the No Video is caused by the Main PWB.

Checking the Crystal X101 "Clock" on the Control Board



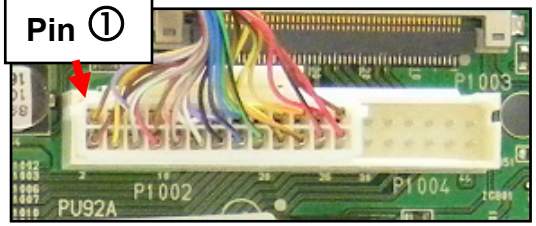
DC Voltage Check
1.5V ~ 1.8V



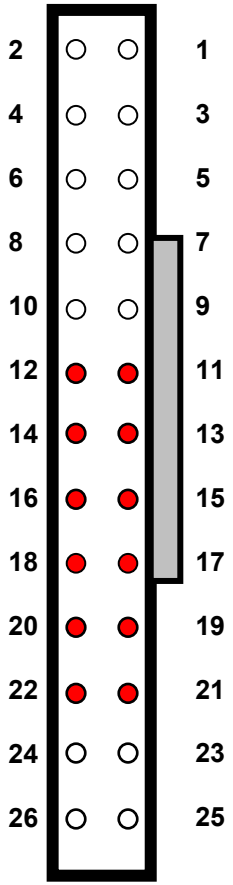
Check the output of the Oscillator package. The frequency of the sine wave is 25.25 MHZ. Missing this clock signal can halt operation of the unit

CONTROL PWB CRYSTAL LOCATION

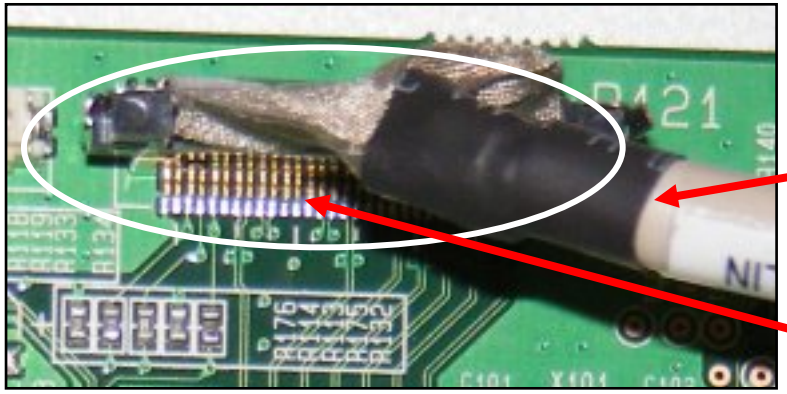
Control LVDS Signals



Connector P1002 Configuration
● - indicates signal pins.



P1002 on Main Board



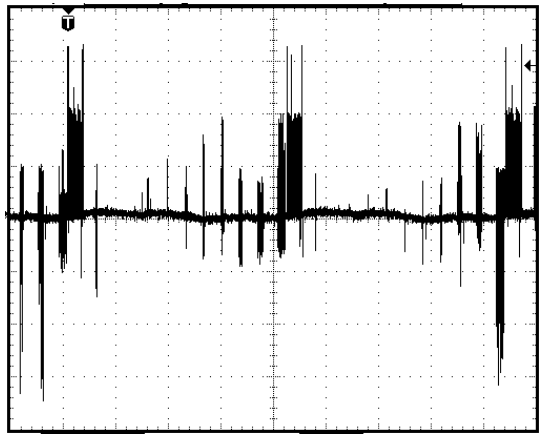
LVDS Cable
P121 on Control PWB shown.
Press two outside tabs inward to release.

Pins are very close together, Use the Main PWB connector.

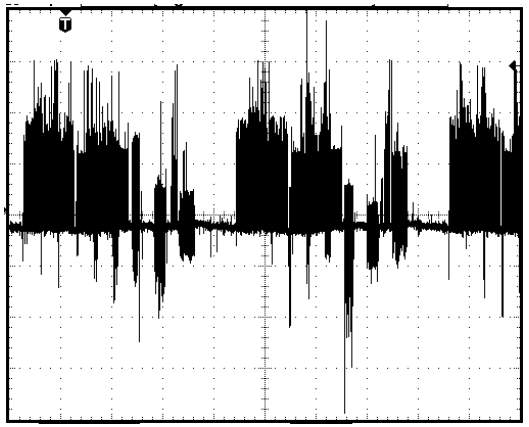
LVDS

Video Signals from the Main Board to the Control Board are referred to as Low Voltage Differential Signals or LVDS. Their presence can be confirmed with the Oscilloscope by monitoring the LVDS signals with no input signal selected while pressing the Menu Button “on” and “off” with the Remote Control or Keypad. Loss of these Signals would confirm the failure is on the Main Board!

Menu Off



Menu ON



Example of Normal Signals measured at 200mv/cm at 5µs/cm.

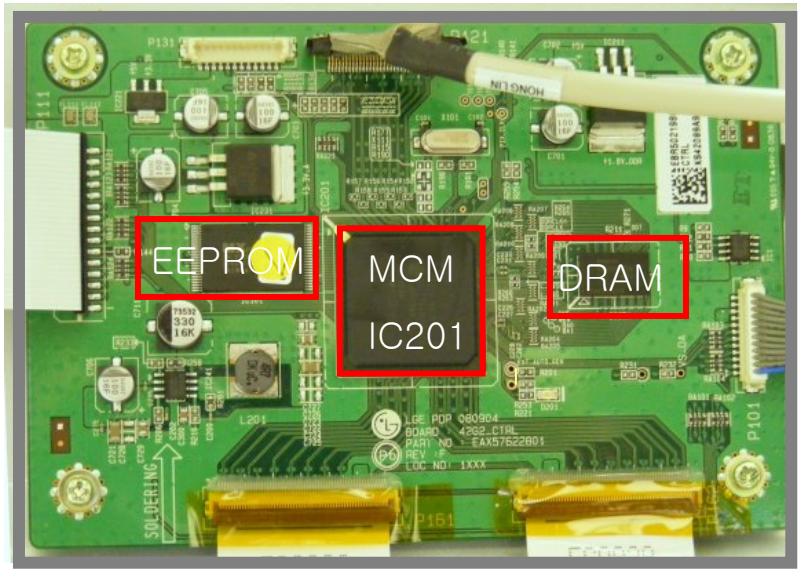
Control PWB Signal Block

The Control Board supplies Video Signals to the TCP (Tape Carrier Package) ICs.

If there is a bar defect on the screen, it could be a Control Board problem.

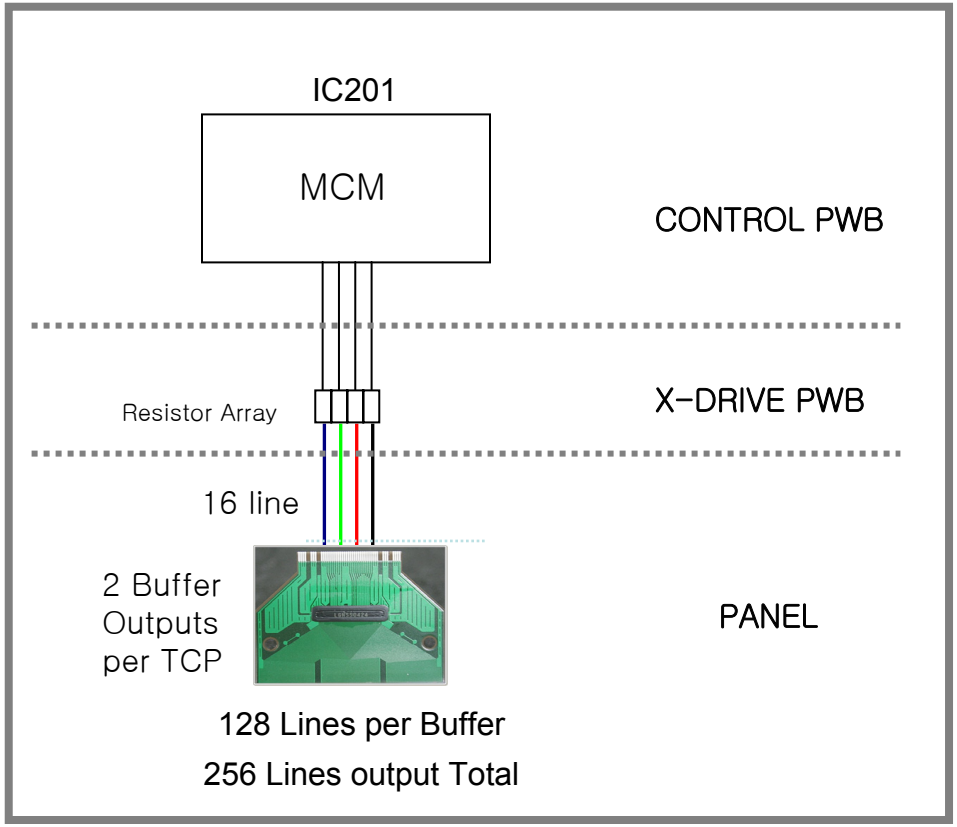
Control Board to X Board Address Signal Flow

This Picture shows Signal Flow Distribution to help determine the failure depending on where the it shows on the screen.



To X-Drive Boards

Basic Diagram of Control Board

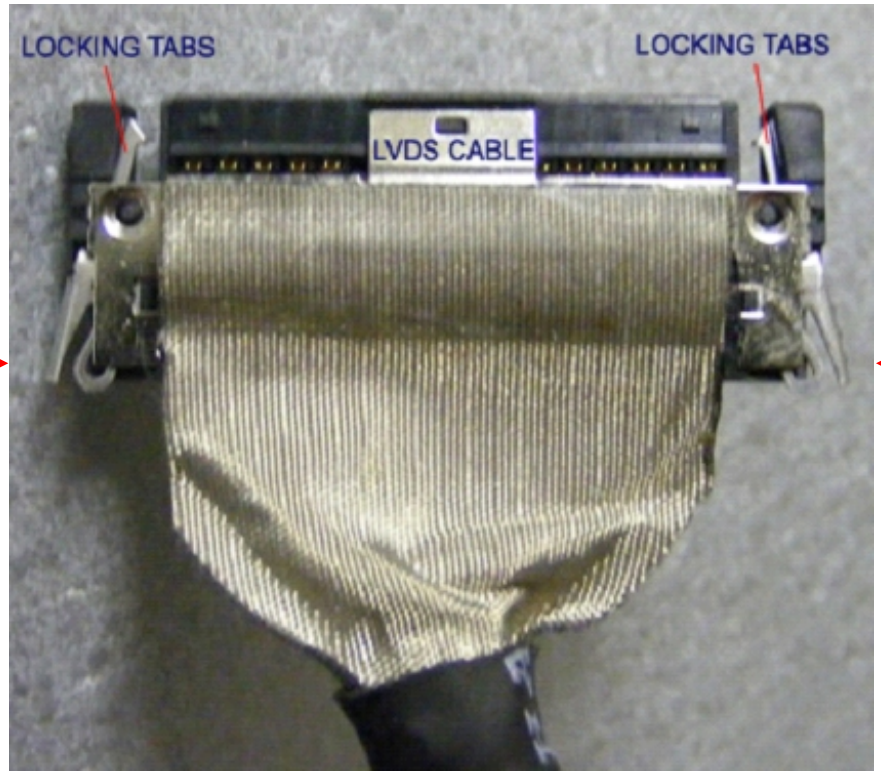


Removing the LVDS Cable from the Control PWB

The LVDS Cable has two “Interlocks” that must be disengaged to remove the LVDS Cable.

To Disengage, press the two Locking Tabs Inward and pull the plug out.

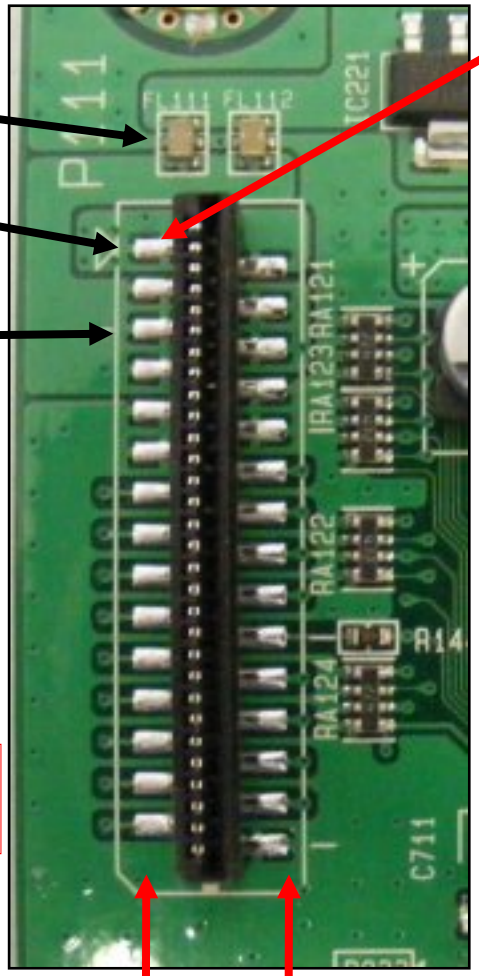
Press Inward



Press Inward

Control PWB Connector P111 to Y-SUS P101 Voltages and Resistance

P111 These pins are very close together. When taking Voltage measurements use Caution.



FL111 and FL112 +5V Fuse

Pins 1, and 2
Receive +15V from the Y-SUS.

Pins 3, 4, 5, 6, and 7
Receive +5V from the Y-SUS.

Pins 9, 10, 11 and 30
Are Ground

All the rest are delivering
Y-Drive logic signals to the Y-SUS Board

The +15V is not used by the Control board, it is routed to the Z-SUS leaving on P101 Pins 11 and 12.

Control P111 to Y-SUS P101 Plug Information

P111 CONNECTOR "Control PWB" to "Y-SUS" P101

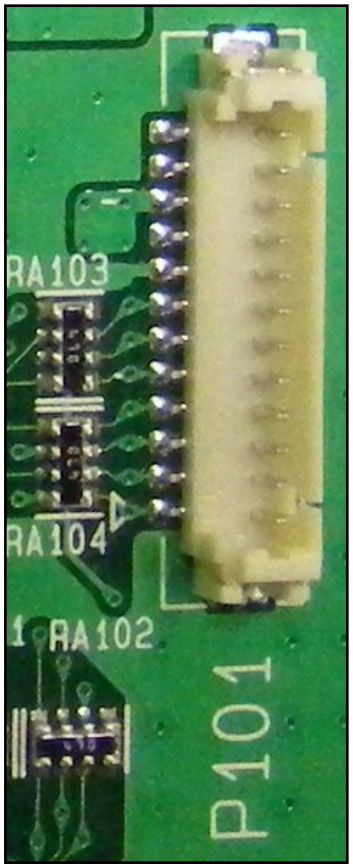
Pin	Label	STBY	Run	Diode Mode	Pin	Label	STBY	Run	Diode Mode
1	15V	0V	15V	Open	2	15V	0V	15V	Open
3	5V	0V	5V	0.44V	4	5V	0V	5V	0.44V
5	5V	0V	5V	0.44V	6	5V	0V	5V	0.44V
7	5V	0V	5V	0.44V	8	Gnd	Gnd	Gnd	Gnd
9	Gnd	Gnd	Gnd	Gnd	10	Gnd	Gnd	Gnd	Gnd
11	Gnd	Gnd	Gnd	Gnd	12	Dummy 2	0V	2.16V	0.65V
13	OE	0V	0V	Open	14	OC2	0V	1.89V	0.65V
15	SUS-DN	0V	0V	0.65V	16	Data	0V	0V	0.65V
17	ER_DN	0V	0V	0.65V	18	BLK	0V	1.4V	0.65V
19	Set_Up	0V	2.5V	0.65V	20	STB	0V	2.96V	0.65V
21	Dummy 5	0V	0.17V	0.65V	22	CLK	0V	0.6V	0.65V
23	Dummy 1	0V	1.05V	0.65V	24	Dummy 3	0V	0V	0.65V
25	ER_UP	0V	0.2V	0.65V	26	Dummy 4	0V	1.28V	0.65V
27	SUS_UP	0V	0.13V	0.65V	28	CTRL_OE	0V	0.1V	0.65V
29	SET_DN	0V	0.12V	0.65V	30	Gnd	Gnd	0V	Gnd

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Control P101 to Z-SUS P2 Plug Information

P101 CONNECTOR "Control PWB" to "Z-SUS" P2

Pin	Label	STBY	Run	Diode Mode
1	Z SUS Dn	0V	0.79V	Open
2	Z SUS Up	0V	0.13V	0.65V
3	Z ER Up	0V	0.19V	0.65V
4	Z ER Dn	0V	0.4V	0.65V
5	Z Bias	0V	0.19V	0.65V
6	Z Enable	0V	0.08V	0.65V
7	Z Ramp Dn	0V	0.19V	0.65V
8	Gnd	Gnd	Gnd	Gnd
9	Gnd	Gnd	Gnd	Gnd
10	5V	0V	4.9V	0.43V
11	15V	0V	15V	Open
12	15V	0V	15V	Open



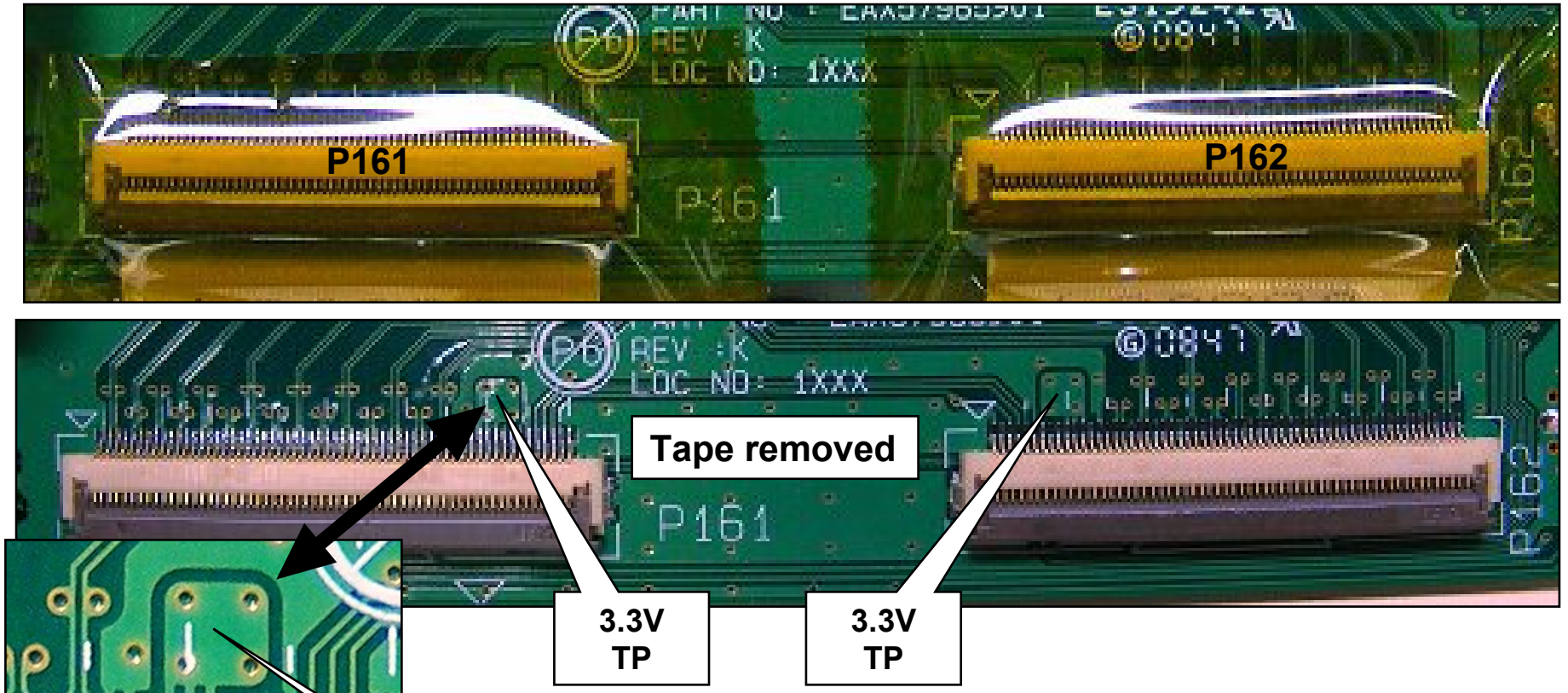
Pin 1 at the bottom of the connector

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Control PWB Connector P161 and P162 to X-Drive PWBs

P161 and P162 Connectors from the "Control PWB" to "X Drive

These pins are covered with tape for transportation issues. (Tape can be removed).



The rest of the pins are much too close together for a safe test.

Left and Right X Drive (Commonly known as A-BUS)

The X Drive PWBs deliver the Color drive signals to the Vertical Grids.
The 42PQ20 has a Left and a Right X-Drive board. Each with 6 connectors to a TCP.
And each TCP with 2 buffers.
Each buffer controls 128 vertical grids lines.

Generally speaking, there isn't many active components on the X-Drive PWBs (Printed Circuit Boards). So they are not prone to failure.

In this section the X-Drive will be discussed and information given allowing the service technician to determine if a failure has occurred in the X-Drive section.

X-BOARDS CONTROL THE VERTICAL GRIDS WHICH DETERMINE THE HORIZONTAL PIXEL COUNT. TOTAL HORIZONTAL GRIDS 3072. TOTAL HORIZONTAL PIXELS 1024.

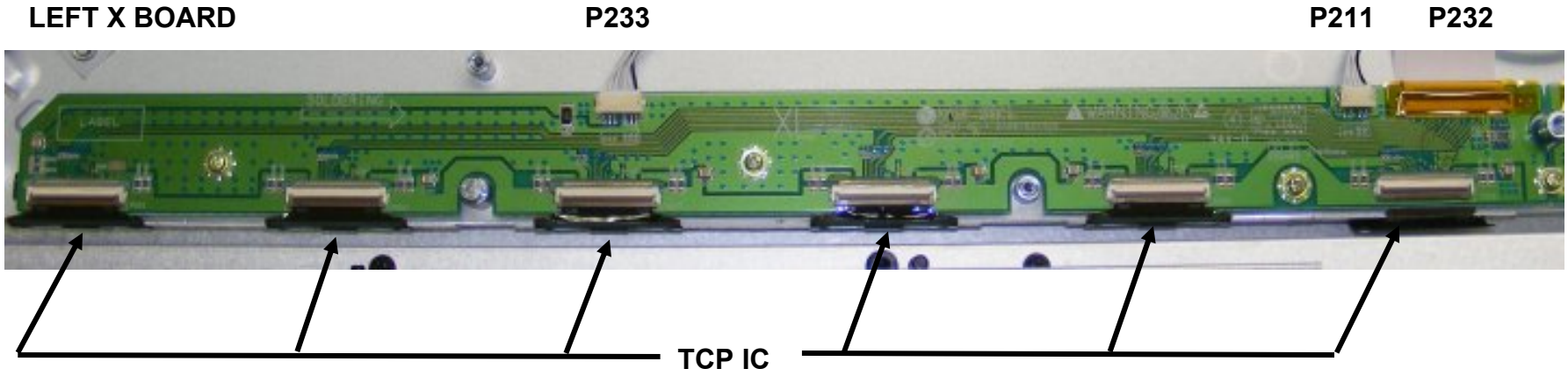
Total Buffer Count = 24
(TCPs = 12 @ 2 buffers per/TCP)

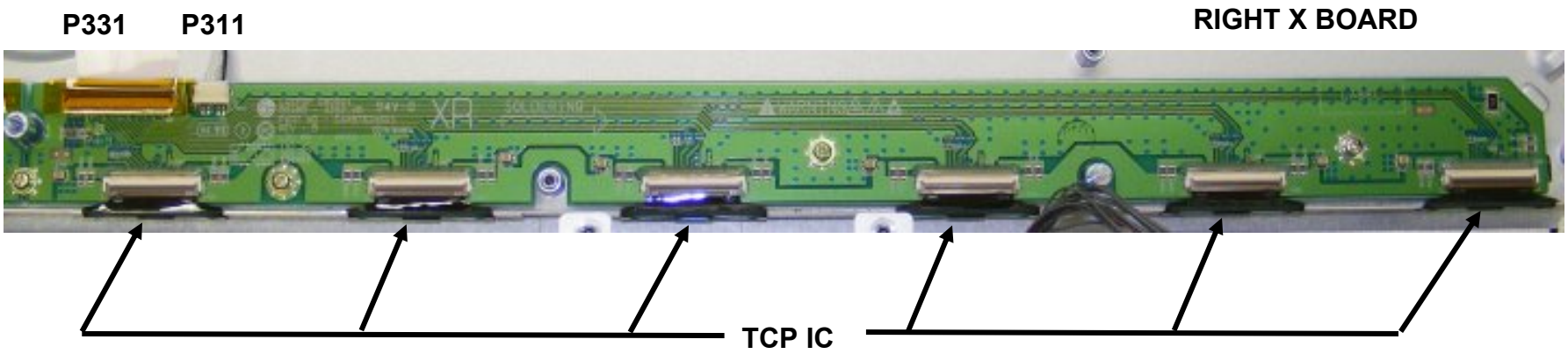
Total Output Pins = 3072
(128 per buffer X 24 total)

Total Pixels (Horizontal) 1024
(3072 / 3) Three cells per pixel (Red, Green and Blue)

Left and Right X Drive (Commonly known as A-BUS)

Warning: DO NOT attempt to run the set with the Heat Sink over the TCPs removed. After a very short time, these ICs will begin to self destruct due to overheating.

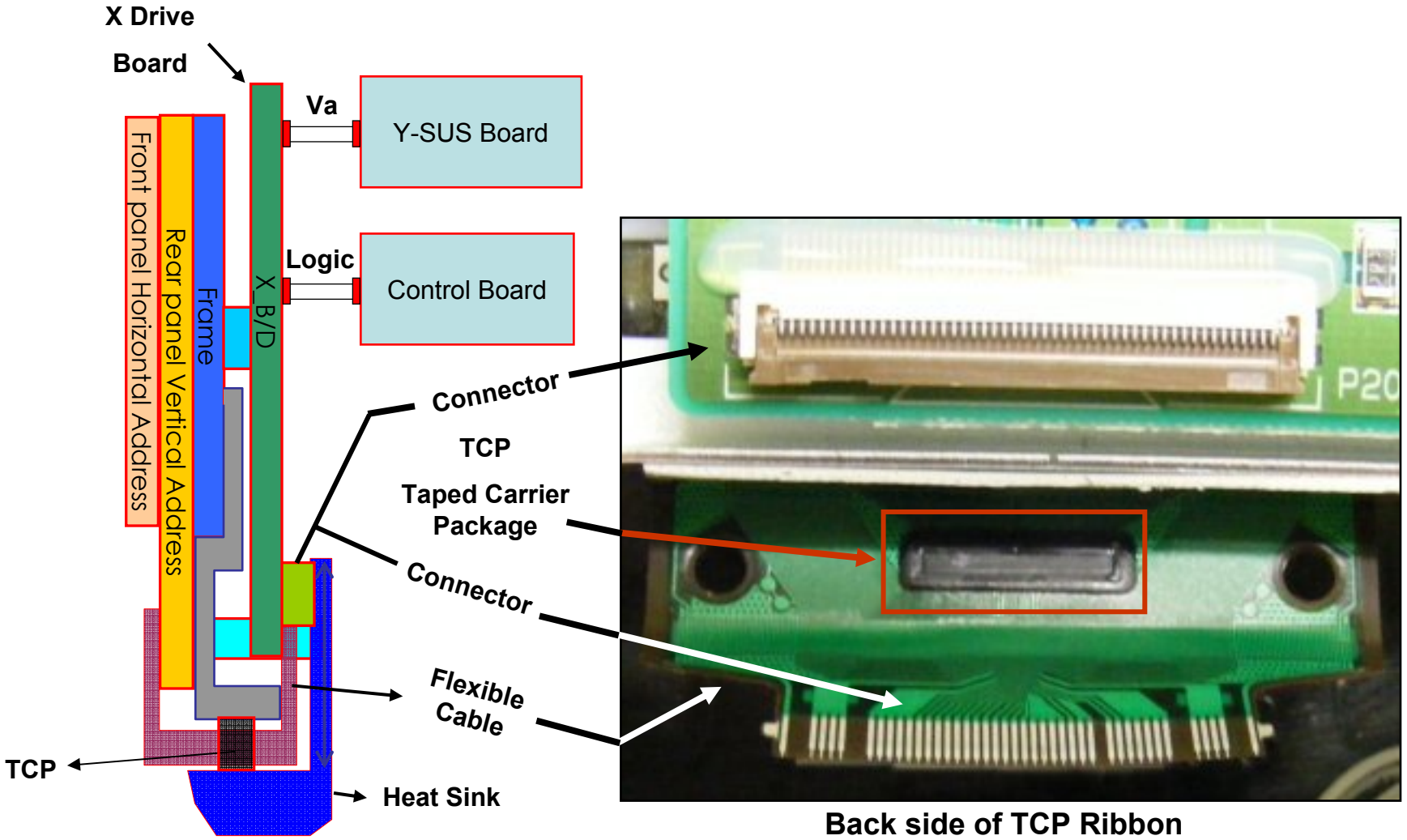




TCP IC's shown are part of the Ribbon Cable

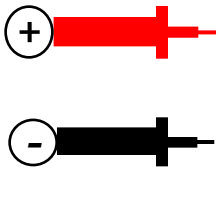
TCP (Tape Carrier Package)

TCP ICs supply RGB 16 bit signal to the PDP by connecting the PAD Electrode of the PANEL with the X Board.



Back side of TCP Ribbon

TCP Testing



On any Gnd

10,11,12,13,14,27,28,29,30,37,38,39,40,41

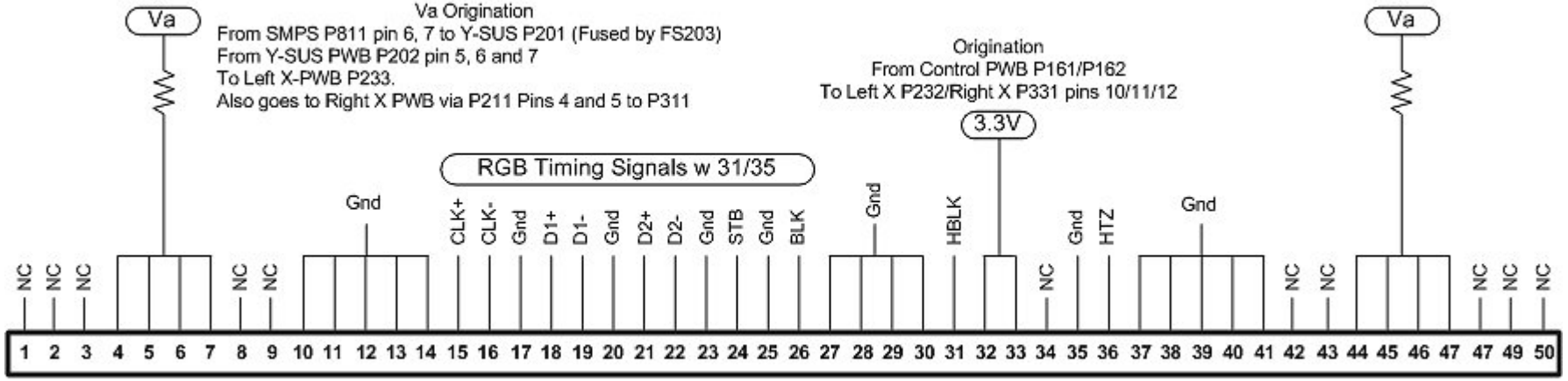
On any Va

4,5,6,7,44,45,46,47

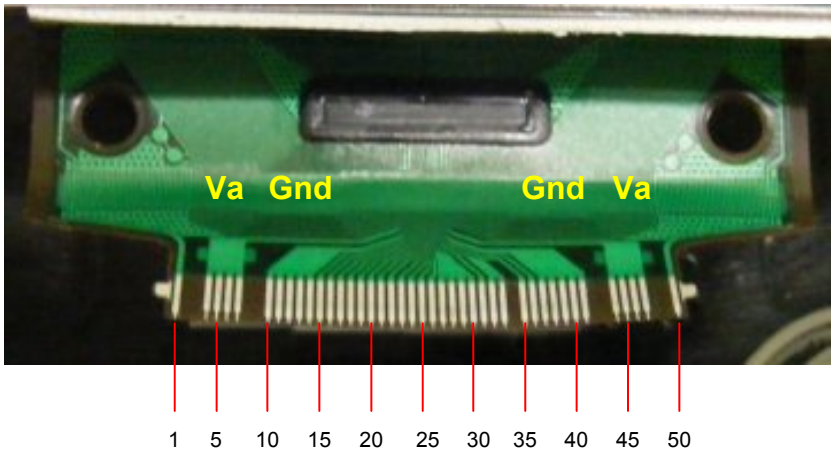
Typical Reading 0.65V

Reverse leads Reading Open

ANY X BOARD CONNECTION TO TCP P201~P206 or P301~P306



Flexible Printed Ribbon Cable to TCP IC



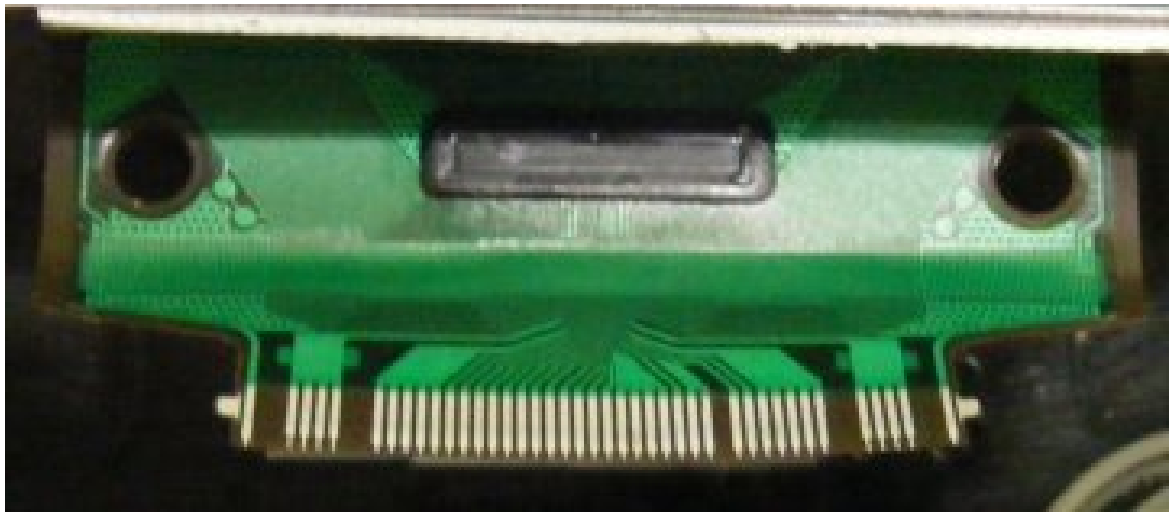
Look for any TCPs being discolored.
Ribbon Damage. Cracks, folds Pinches, scratches, etc…

TCP Visual Observation. Damaged TCP

Warning: DO NOT attempt to run the set with the Heat Sink over the TCPs removed. After a very short time, these ICs will begin to self destruct due to overheating.

This damaged TCP can,

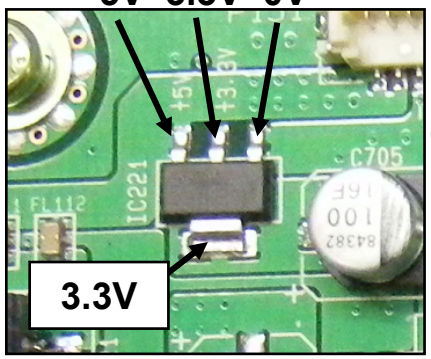
a) Cause the Power Supply to shutdown
b) Generate abnormal vertical bars
c) Cause the entire area driven by the TCP to be “All White”
d) Cause the entire area driven by the TCP to be “All Black”
e) Cause a “Single Line” defect

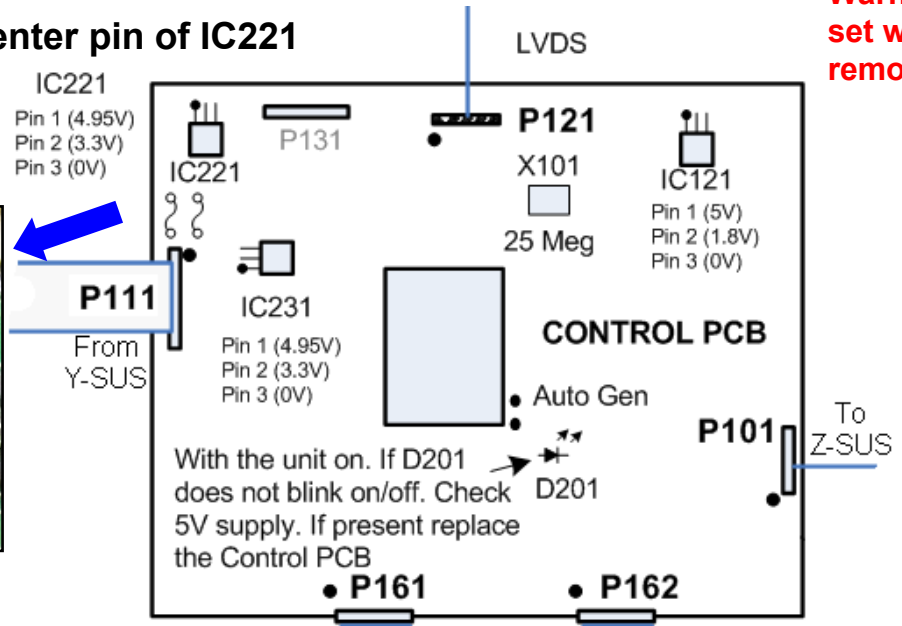


TCP 3.3V B+ Check

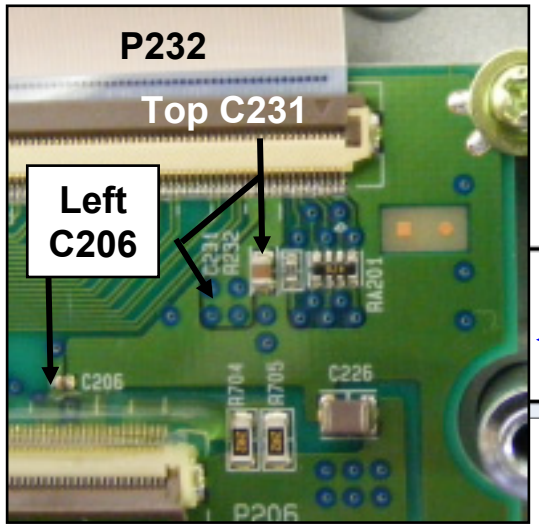
Warning: DO NOT attempt to run the set with the Heat Sink over the TCPs removed.

Check for 3.3V on center pin of IC221

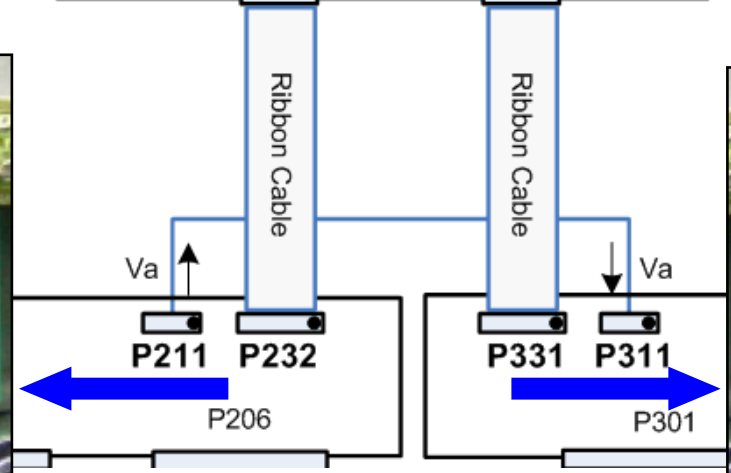




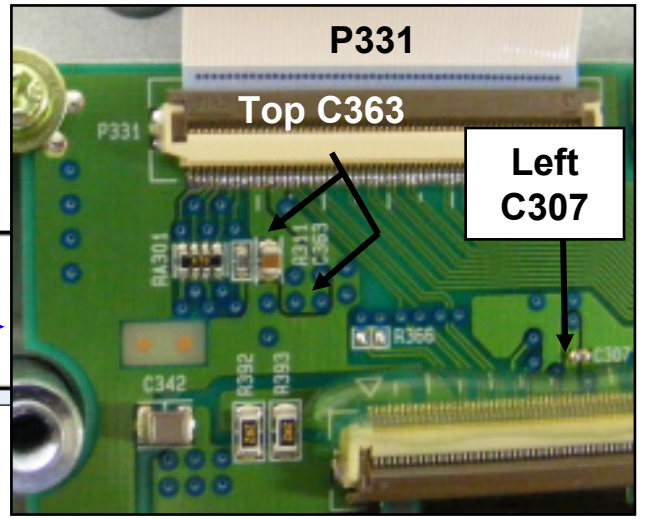
Check for 3.3V



3.3V in on Pins 49-50-51



Check for 3.3V



3.3V in on Pins 49-50-51

Left X PWB

Right X PWB

X Drive Left Connector P211 Voltages and Resistance

Voltage and Diode Mode Measurements for the X Drive Board

P211 CONNECTOR "X Drive Left" to "X-Drive Right" P211

Pin	Label	STBY	Run	Diode Mode
1	Gnd	0V	Gnd	Gnd
2	Gnd	0V	Gnd	Gnd
3	15V	0V	15.4V	Open
4	n/c	0V	n/a	n/a
5	n/c	0V	n/a	n/a
6	VPP/ER1	0V	*61.4V	Open
7	VPP/ER1	0V	*61.4V	Open
8	VA	0V	*64.9V	Open

*** Note: This voltage will vary in accordance with Panel Label**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

X Drive Right Connector P311 Voltages and Resistance

Voltage and Diode Mode Measurements for the X Drive Board

P311 CONNECTOR "X Drive Right" to " X Drive Left" P311

Pin	Label	STBY	Run	Diode Mode
1	Gnd	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd	Gnd
3	15V	0V	15V	Open
4	n/c	0V	n/a	n/a
5	n/c	0V	n/a	n/a
6	VPP/ER2	0V	*61.4V	Open
7	VPP/ER2	0V	*61.4V	Open
8	VA	0V	*64.9V	Open

*** Note: This voltage will vary in accordance with Panel Label**

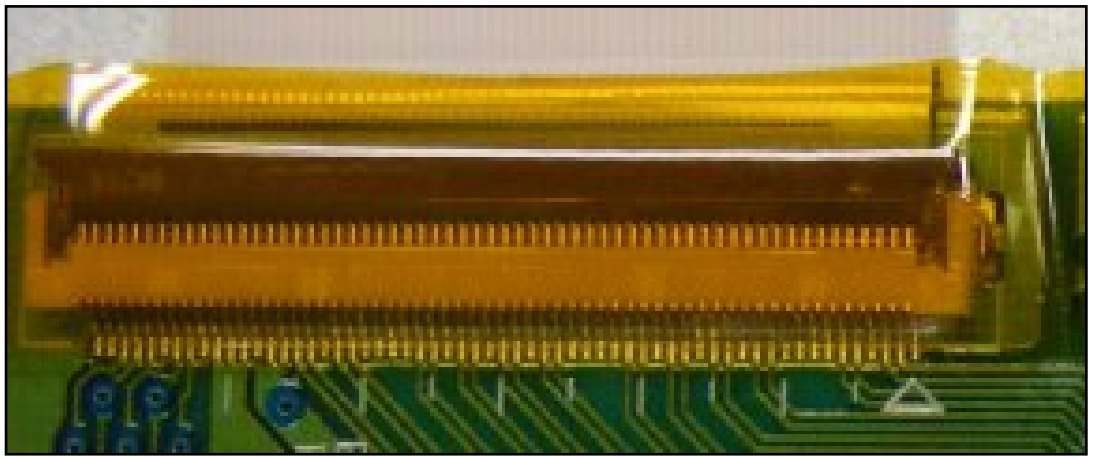
Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

X Drive Left and Right Connector P232 and P331

Voltage and Diode Mode Measurements for the X Drive Board

Voltage and Diode Mode Measurements for these connectors are difficult to read. They are too close together for safe test.

The pins are also protected by a layer of tape to prevent the tab from being released causing separation from the Cable and the connector.



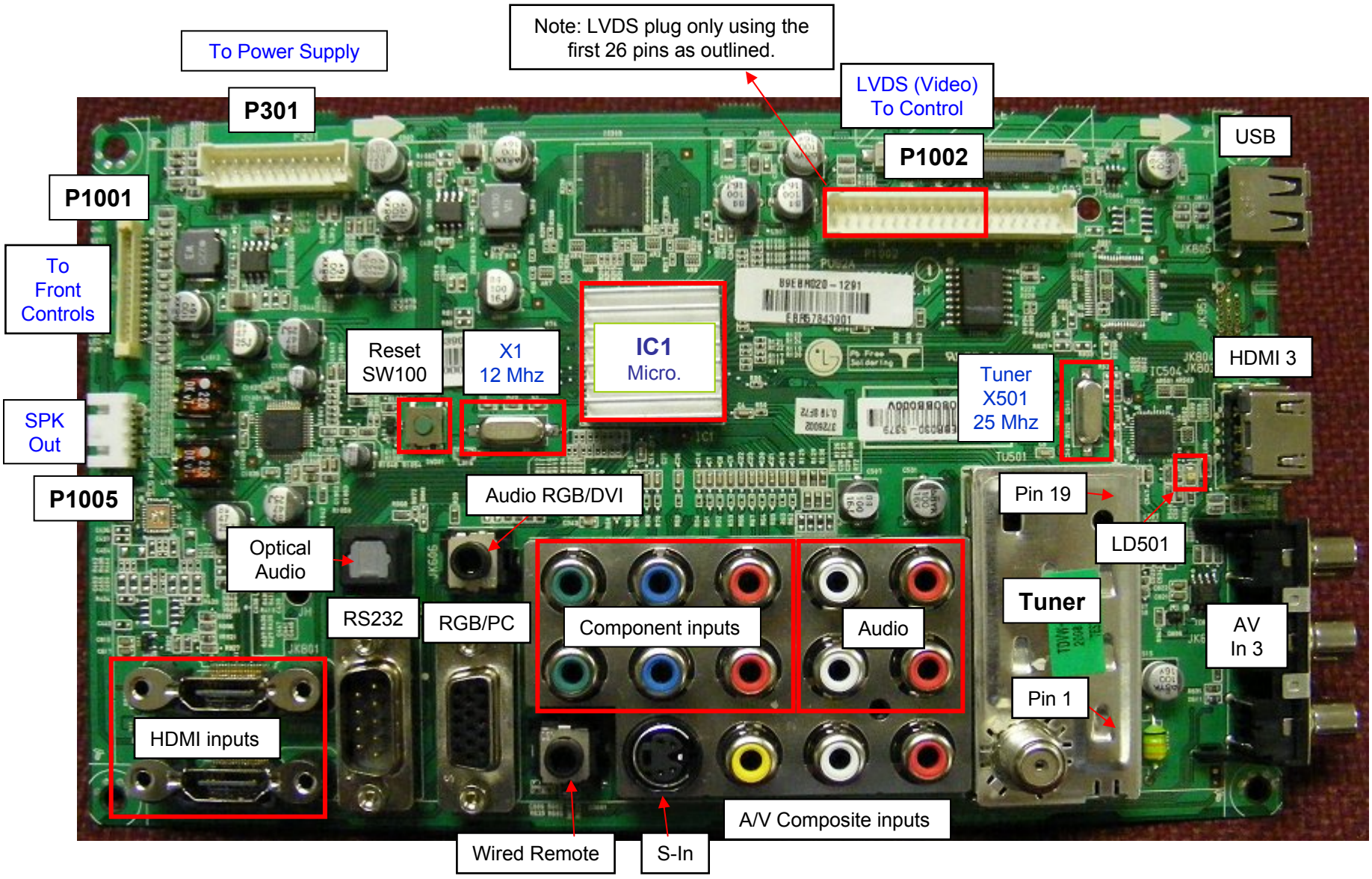
Main PWB Troubleshooting

This Section of the Presentation will cover troubleshooting the Main Board. Upon completion of this Section the technician will have a better understanding of the operation of the circuit and will be able to locate voltage and resistance test points needed for troubleshooting and alignments.

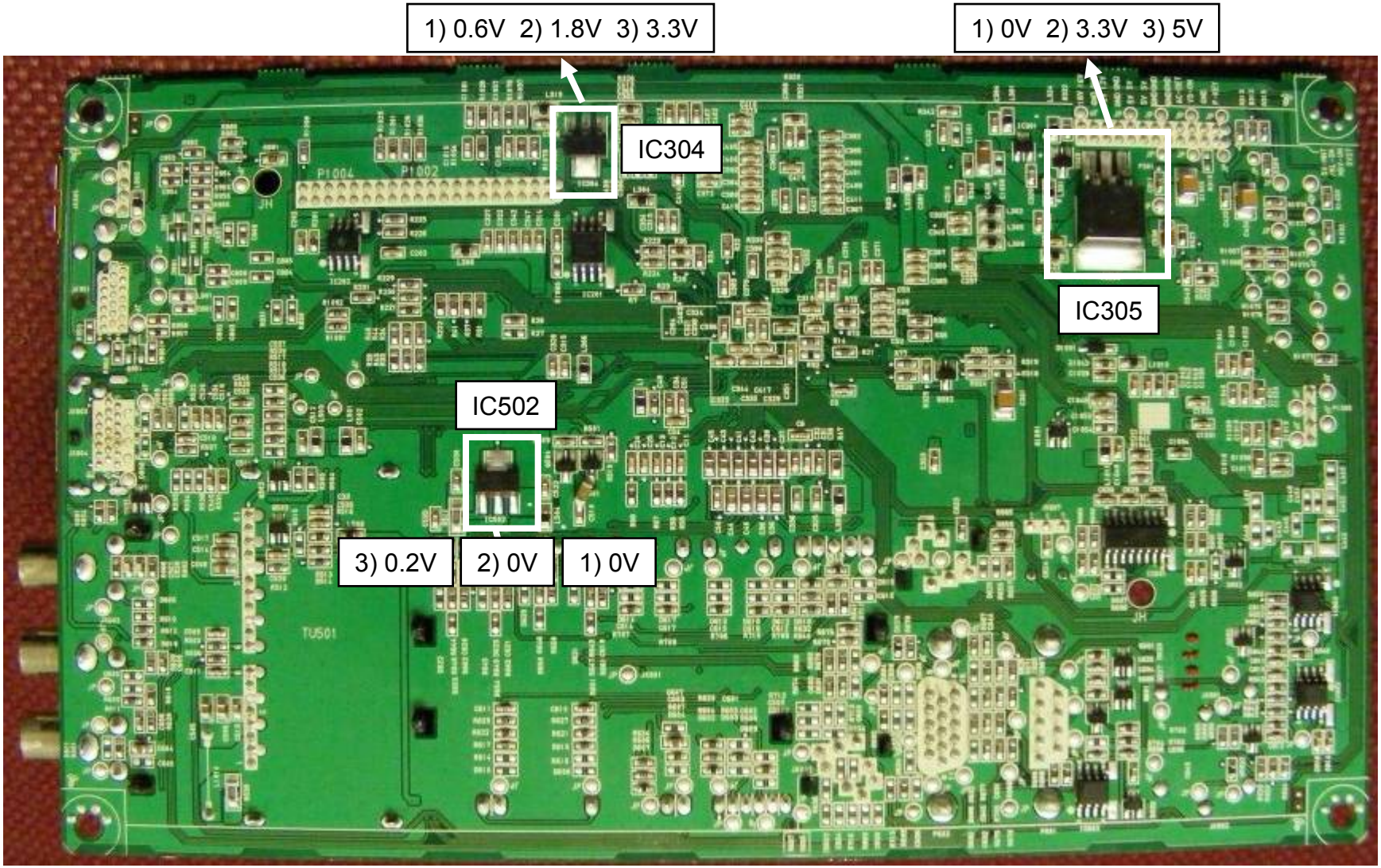
- DC Voltage and Waveform Checks
- Resistance Measurements

Operating Voltages		
	SMPS Supplied	5V Stand-By 12V 16V
	Developed on the Main Board	5V 3.3V (2) 2.5V 1.8V

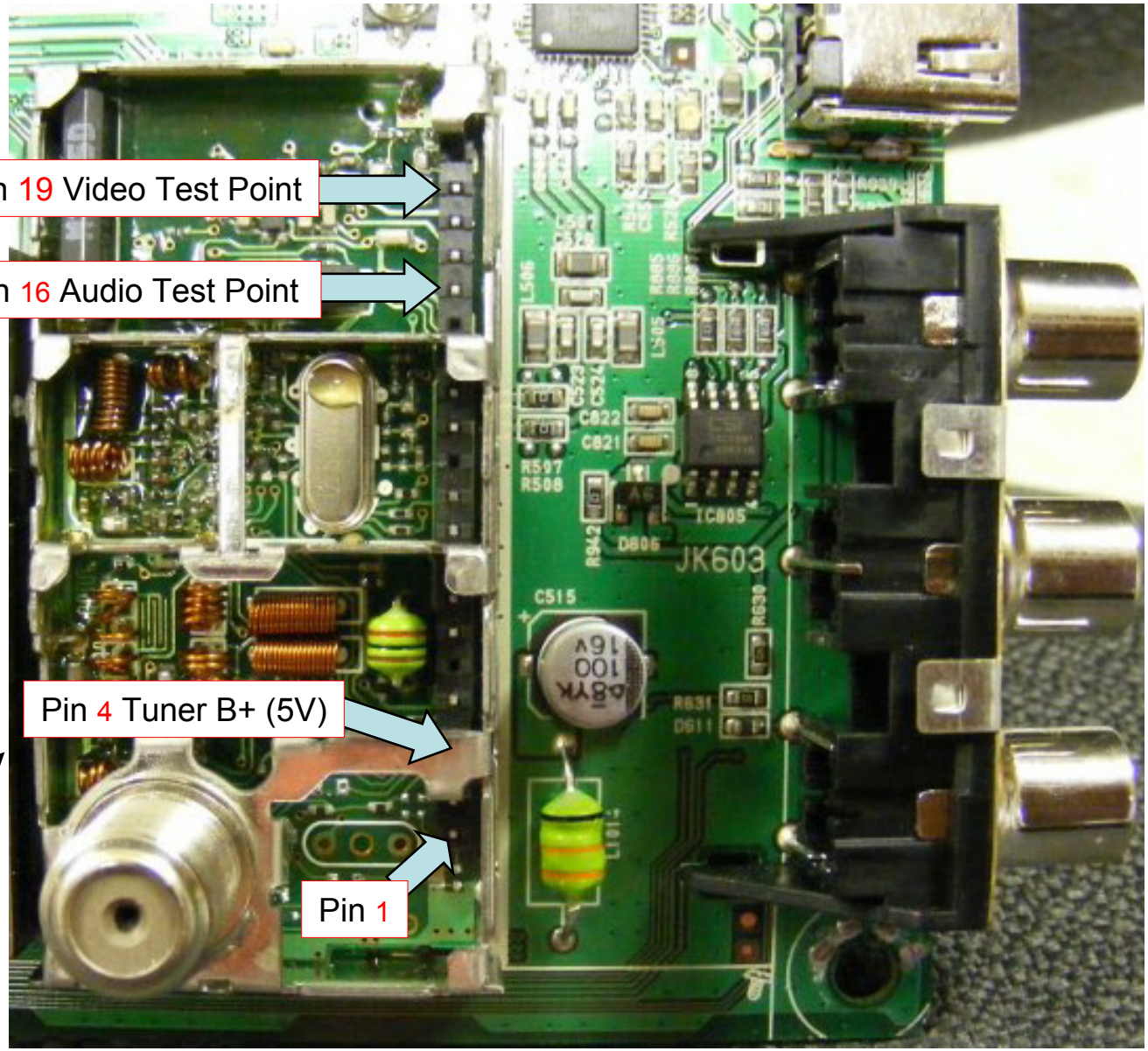
Main PWB Layout and Identification



Main PWB Back Side (Regulator Checks)

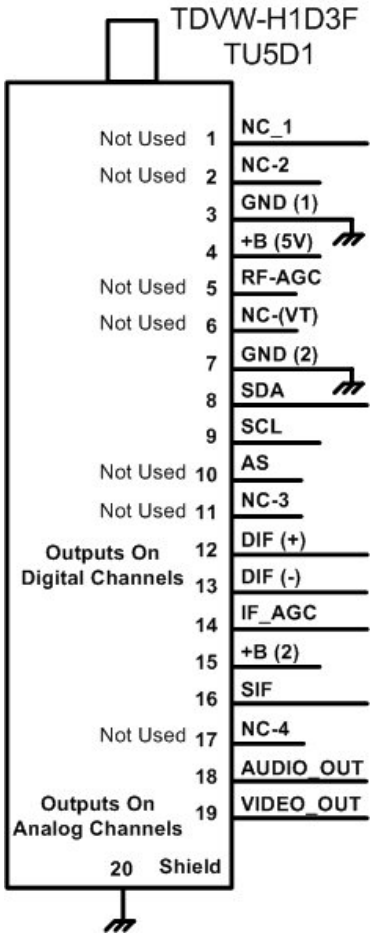


Main PWB Tuner Check (Shield Off) Pins Exposed



Main PWB Tuner Video and SIF Output Check

USING COLOR BAR SIGNAL INPUT

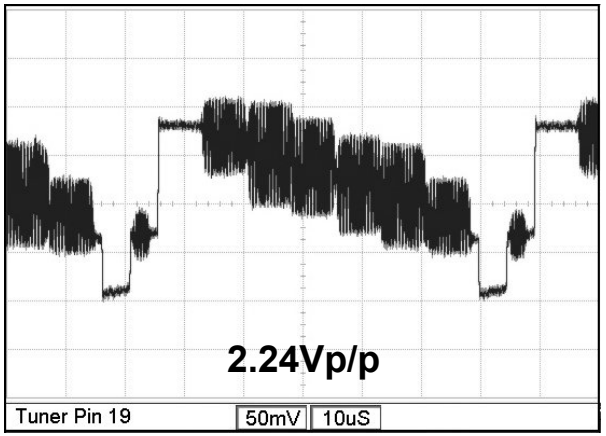


MAIN PWB

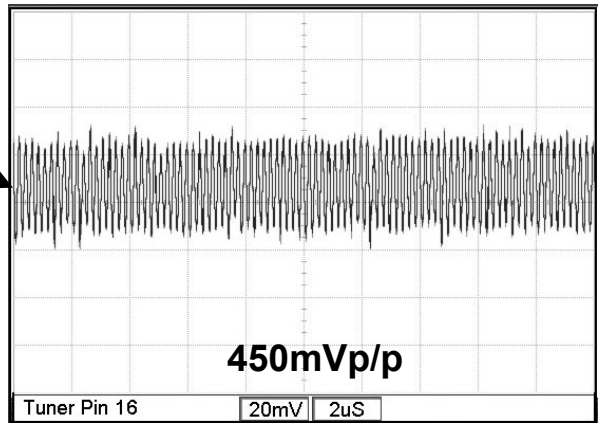
Tuner Location

Pin 1

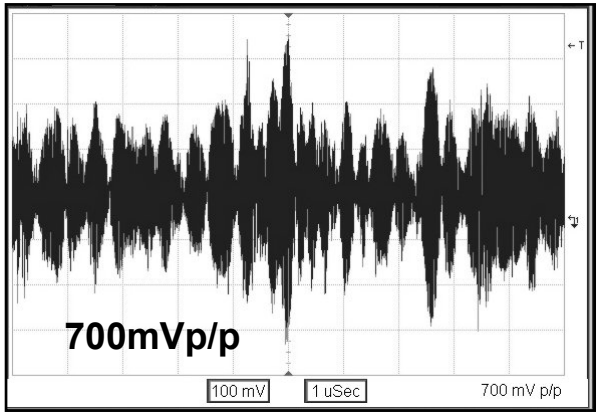
Pin 19 "Video" Signal



Pin 16 "SIF" Signal



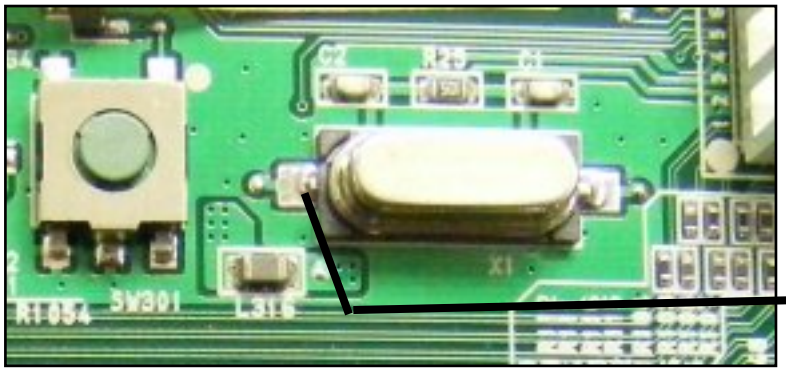
Pin 12 and Pin 13 "Dig IF" Signal



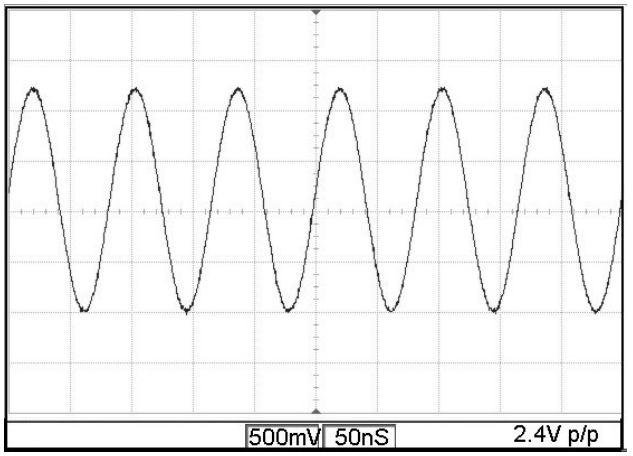
Note:
"Video Out" Signal only when receiving an analog Channel.

Note:
"Dig IF" Signal only when receiving a Digital Channel.

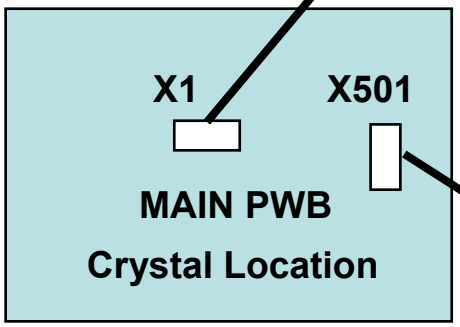
Main PWB Crystal X1 and X501 Check

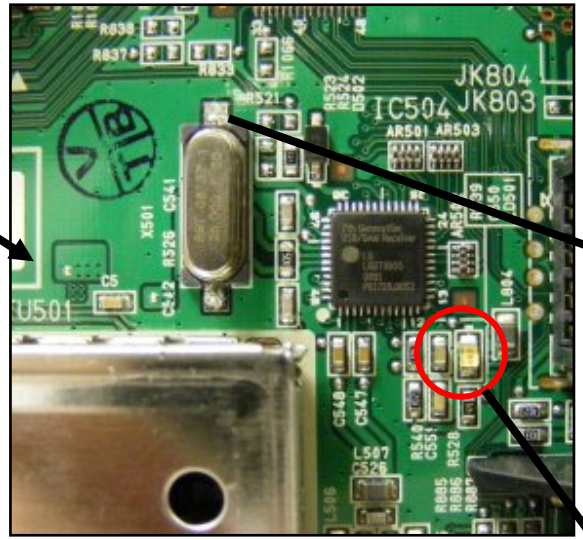


X1 (1.5V DC) / (2.4V p/p)
12Mhz

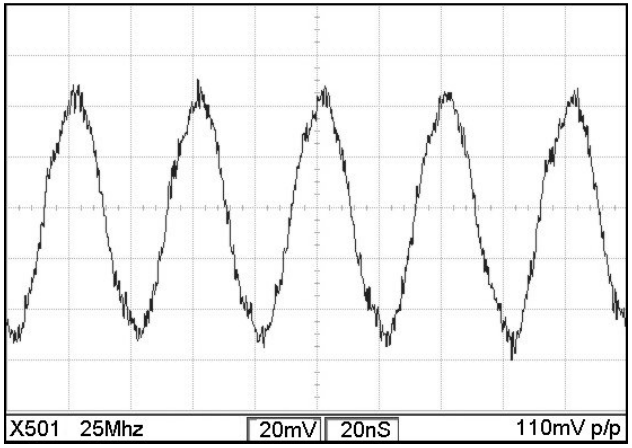


Runs all the time





X501 (1.5V DC) / (110mV p/p)
25Mhz

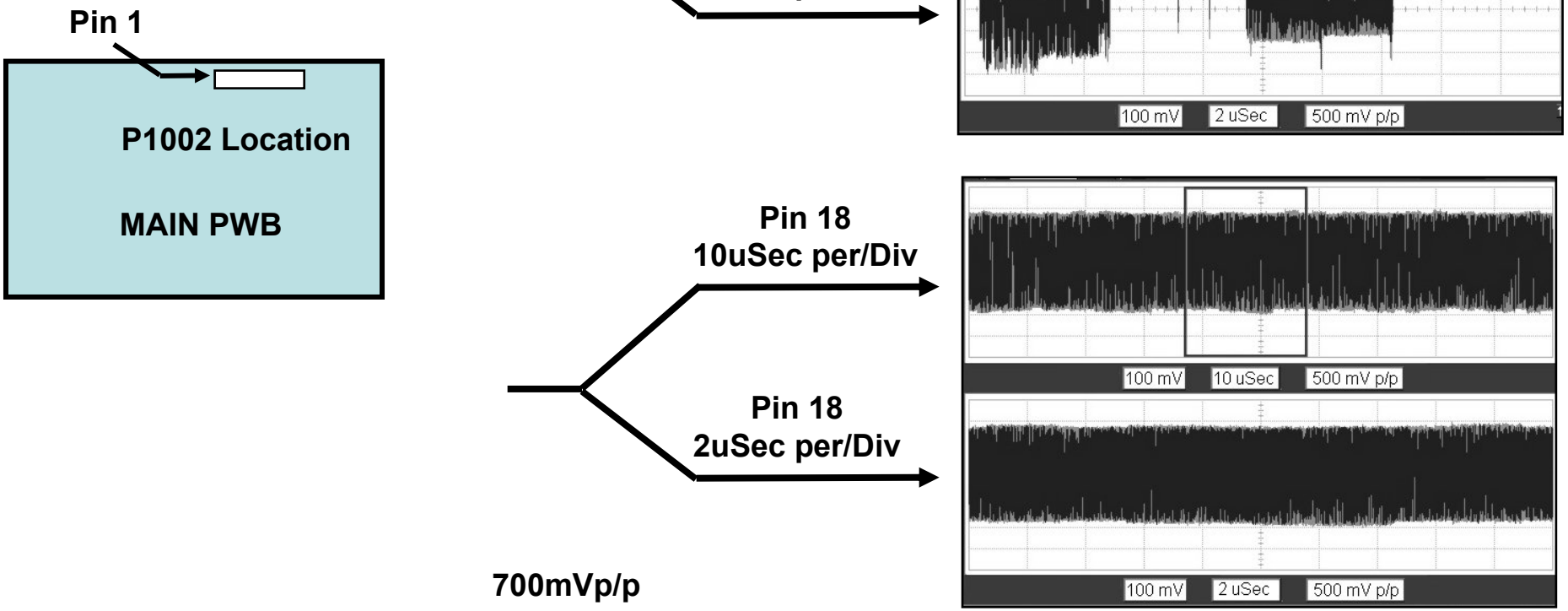


Runs only at first turn on when LD501 is illuminated.

LD501

Main PWB P1002 LVDS Video Signal Check

USING GRAY SCALE SIGNAL INPUT



Main PWB Plug P1002 "LVDS" Resistance

Note: P1002 Only uses first 26 Pins of the plug.

Voltage and Resistance Measurements for the Main Board

P1002 CONNECTOR "Main" Odd Pins to P121 "Control PWB"

Pin	SBY	Run	Diode Mode
1	0V	0V	Open
3	0V	3.29V	2.49V
5	Gnd	Gnd	Gnd
7	Gnd	Gnd	Gnd
9	0V	3.29V	2.49V
11	0V	1.25V	0.85V
13	0V	1.25V	0.85V
15	0V	1.27V	0.77V
17	0V	1.22V	0.77V
19	0V	1.24V	0.77V
21	0V	1.24V	0.85V
23	0V	0.58V	1.01V
25	0V	2.81V	0.49V

P1002 CONNECTOR "Main" Even Pins to P121 "Control PWB"

Pin	SBY	Run	Diode Mode
2	0V	0V	Open
4	0V	3.28V	2.49V
6	Gnd	Gnd	Gnd
8	Gnd	Gnd	Gnd
10	0V	3.29V	2.44V
12	0V	1.21V	0.77V
14	0V	1.21V	0.85V
16	0V	1.21V	0.91V
18	0V	1.25V	0.81V
20	0V	1.21V	0.85V
22	0V	1.18V	0.77V
24	0V	3.29V	1.3V
26	Gnd	Gnd	Gnd

Resistance Readings with the PWB Disconnected. DVM in the Diode mode.

Main PWB Plug P1001 to Ft Keys Voltages and Resistance

Voltage and Diode Mode Measurements for the Main Board

P1001 CONNECTOR "MAIN PWB" to "Front Keys"

Pin	Label	STBY	Run	Diode Mode
1	IR	5V	5V	3.2V
2	Gnd	Gnd	Gnd	Gnd
3	Key1	3.29V	3.29V	1.6V
4	Key2	3.29V	3.29V	1.6V
5	P Key	0V *(5V)	0V	Open
6	Gnd	Gnd	Gnd	Gnd
7	EYE-SCL	0V	3.28V	2.5V
8	EYE-SDA	0V	3.28V	2.5V
9	Gnd	Gnd	Gnd	Gnd
10	5VST	5V	5V	1.06V
11	3.3VST	0V	5.13V	1.1V
12	Gnd	Gnd	Gnd	Gnd
13	LED-R	3.3V	0V	3.22V
14	LED-W	0V	03.25	Open
15	PWM	Gnd	Gnd	Gnd

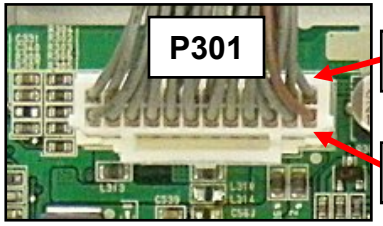
Stand By 5V

*** Pin 5 (Power Key) This pin is 0V when the button is lock "On" (In) and 5V when Locked "Off" (Out)**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

P301 Connector ID and Voltages

Voltage and Diode Mode Measurements for the Main PWB



P301 CONNECTOR "Main" Even Pins to "SMPS PWB" P813

Pin	Label	STBY	Run	Diode Mode
1	17V	0V	17.3V	Open
3	Gnd	Gnd	Gnd	Gnd
5	12V	0V	12V	2.8V
7	Gnd	Gnd	Gnd	Gnd
9	Stby 5V	5V	5V	1.1V
11	Stby 5V	5V	5V	1.3V
13	Gnd	Gnd	Gnd	Gnd
15	Gnd	Gnd	Gnd	Gnd
17	5V Det	0V	5V	2.98V
19	RL On	0V	3.73V	Open
21	M5 ON	0V	3.26V	Open
23	Stby5V	5V	5V	1.06V

Pin	Label	STBY	Run	Diode Mode
2	17V	0V	17.3V	Open
4	Gnd	Gnd	Gnd	Gnd
6	12V	0V	12V	2.8V
8	Gnd	Gnd	Gnd	Gnd
10	Stby 5V	5V	5V	1.1V
12	Stby 5V	5V	5V	1.1V
14	Gnd	Gnd	Gnd	Gnd
16	n/a	-	-	Gnd
18	AC Det	5V	5V	Open
20	Vs On	0V	3.2V	Open
22	AUTO	0V	0V	Gnd
24	Key On	0V	0V	Open

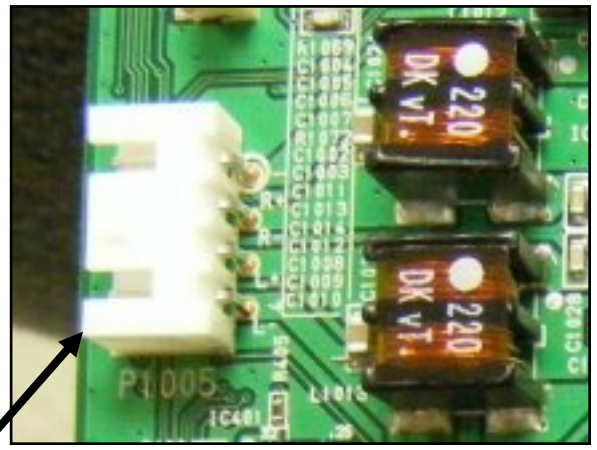
Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Main PWB Speaker Plug P1005 Voltages and Resistance

Voltage and Diode Mode Measurements for the Main Board Speaker Plug

P1005 CONNECTOR "Main" to "Speakers"

Pin	Label	SBY	Run	Diode Mode
1	R+	0V	8.65V	2.58V
2	R-	0V	8.65V	2.58V
3	L+	0V	8.65V	2.58V
4	L-	0V	8.65V	2.58V



P1005
Speaker
Connector

Board
Location

MAIN
PWB

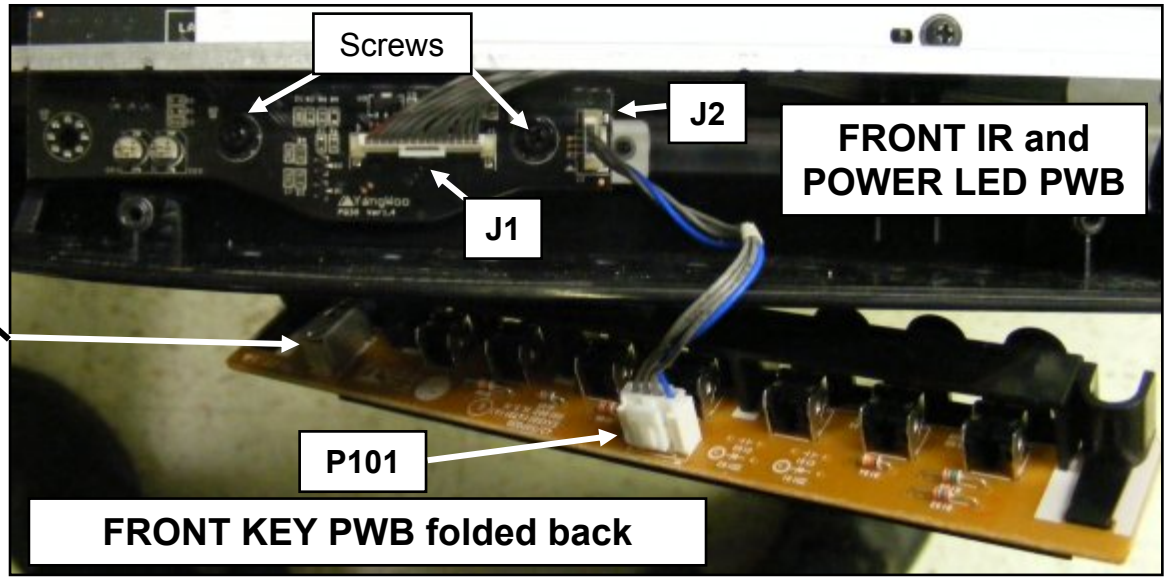
Resistance Readings with the PWB Disconnected. DVM in the Diode mode.

Ft Control PWB and Power LED (IR) PWB Removal

The Control Switch PWB and Power Switch PWB are located (as viewed from the rear) in the lower left hand section.

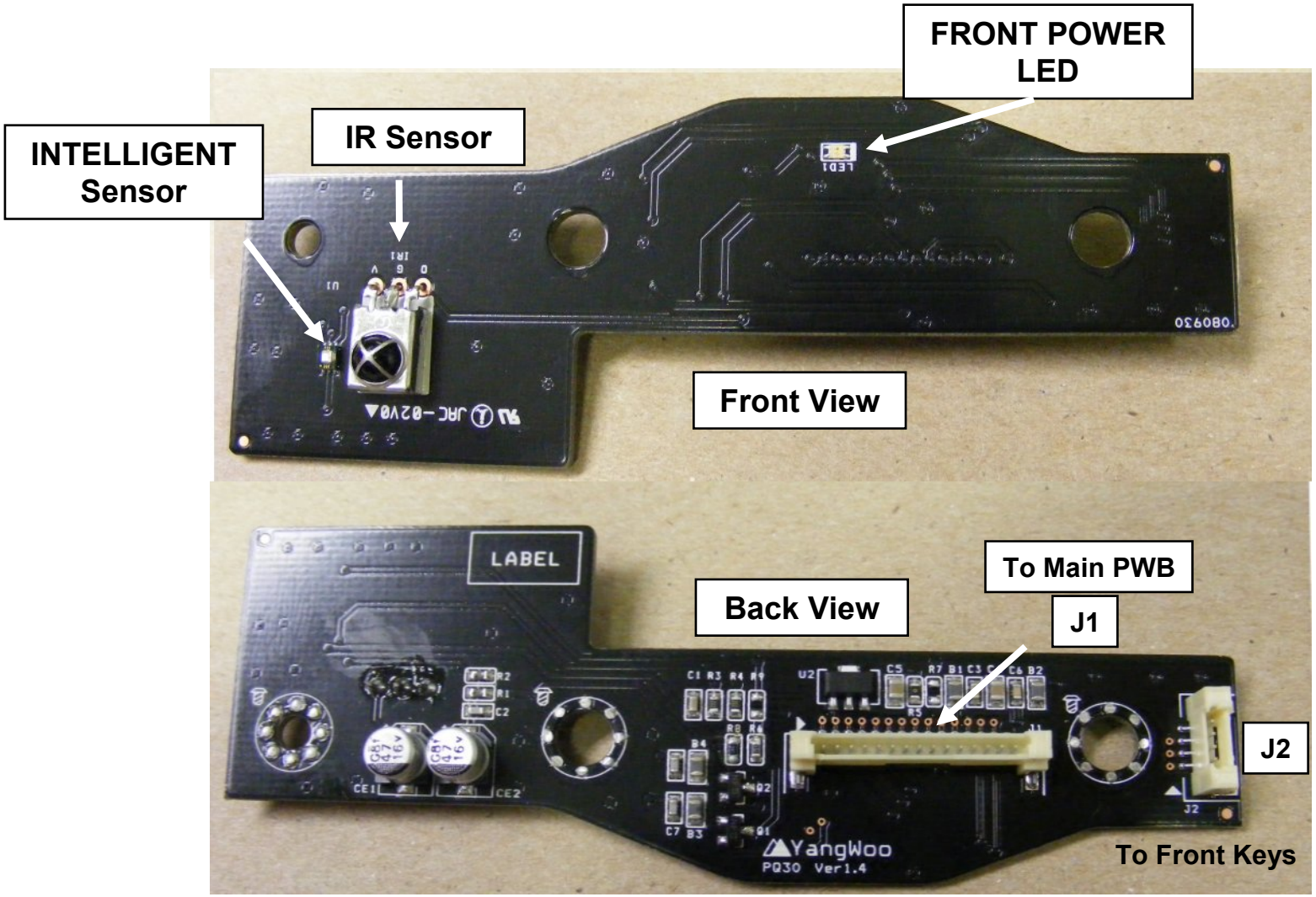
REMOVAL: Remove the 2 screws and unplug the connector P101.
Then remove the 2 screws from the Front IR and Power LED PWB. Remove J1connector.

NEW:
Master Power Switch Set will not function With this Mechanical" switch down in the open position.



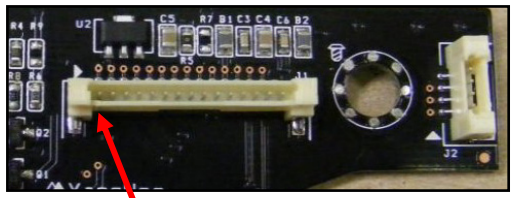
Ft Power LED (IR) PWB Layout

The Ft Power LED PWB includes the IR Receiver and the Intelligent Sensor.
The Front POWER LED is also located on this board.



Front LED PWB Plug J1 to Main Voltages and Resistance

Voltage and Diode Mode Measurements for the Main Board



J1 Pin (1)

J1 CONNECTOR "MAIN PWB" to "Front Keys"

Pin	Label	STBY	Run	Diode Mode
1	IR	5V	5V	Open
2	Gnd	Gnd	Gnd	Gnd
3	Key1	3.29V	3.29V	Open
4	Key2	3.29V	3.29V	Open
*5	P Key	0V *(5V)	0V	Open
6	Gnd	Gnd	Gnd	Gnd
7	EYE-SCL	0V	3.28V	2.36V
8	EYE-SDA	0V	3.28V	2.36V
9	Gnd	Gnd	Gnd	Gnd
10	5VST	5V	5V	Open
11	3.3VST	0V	5.13V	1.88V
12	Gnd	Gnd	Gnd	Gnd
13	LED-R	3.3V	0V	Open
14	LED-W	0V	03.25	Open
15	PWM	Gnd	Gnd	Open

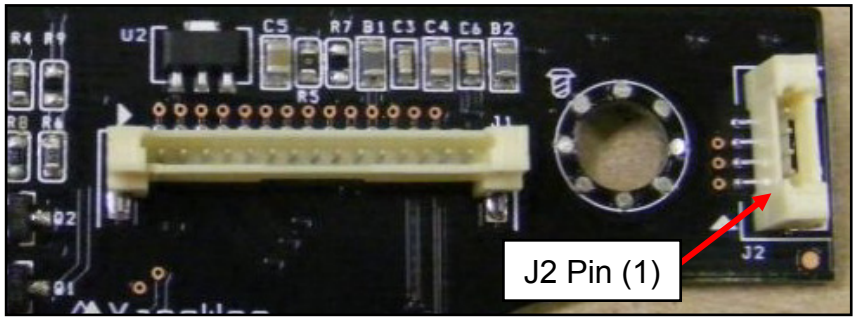
Stand By 5V

*** Pin 5 (Power Key) This pin is 0V when the Main Power button is locked "On" (In) and 5V when it is locked "Off" (Out)**

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Front LED PWB Plug J2 to Key PWB Voltages and Resistance

Voltage and Diode Mode Measurements for the Main Board



*STBY1 Main Power Switch “OUT”

J2 CONNECTOR “Ft LED PWB" to "Ft Keys"

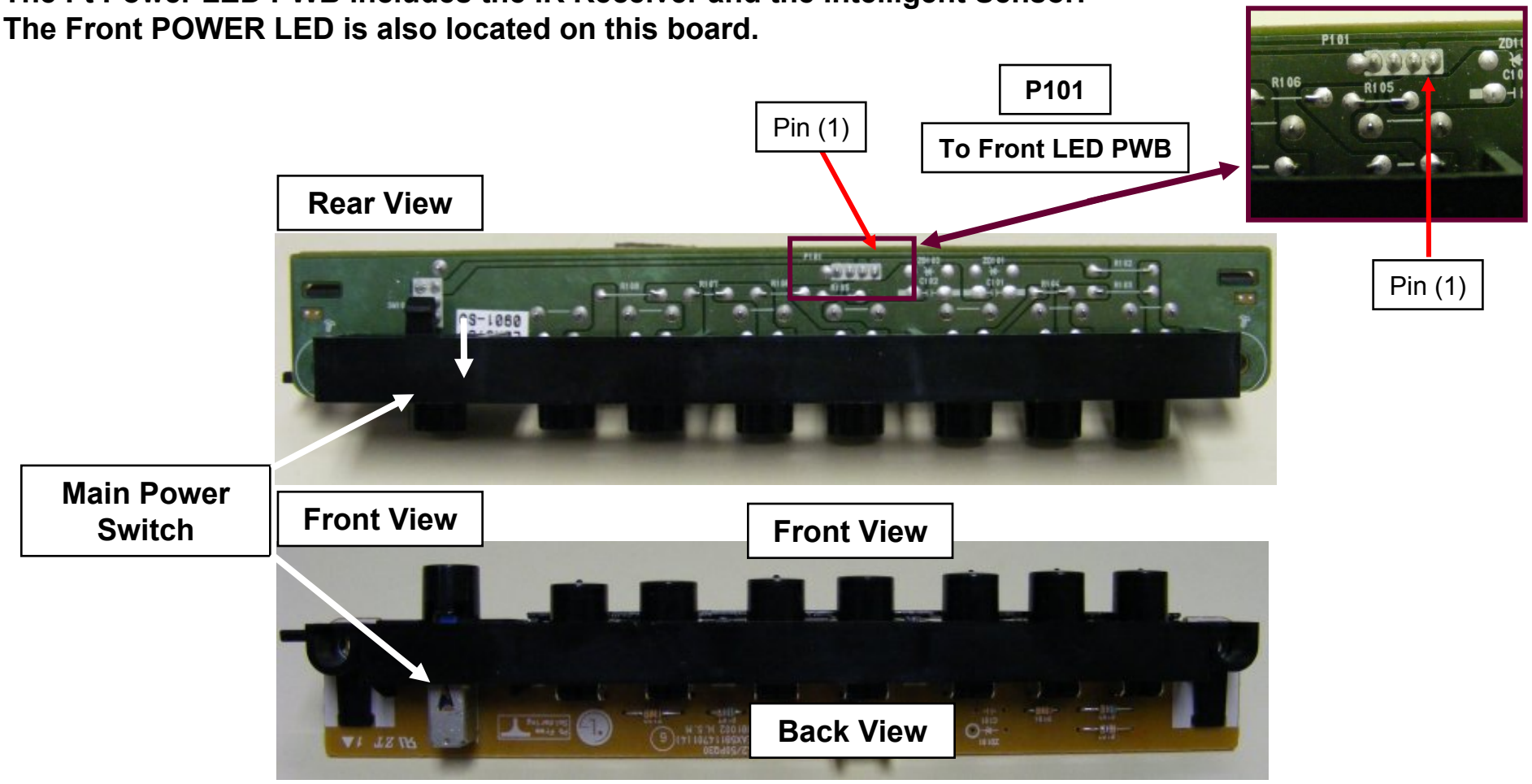
Pin	*STBY1	*STBY2	Run	Diode Mode
1	0V	3.29V	3.29V	Open
2	0V	3.29V	3.29V	Open
3	4.38V	Gnd	0V	Gnd
4	Gnd	Gnd	Gnd	Gnd

*STBY2 Main Power Switch “IN”

Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

Front Key PWB Layout

The Ft Power LED PWB includes the IR Receiver and the Intelligent Sensor.
The Front POWER LED is also located on this board.



Front LED PWB Plug P101 to Ft LED PWB Voltages and Resistance

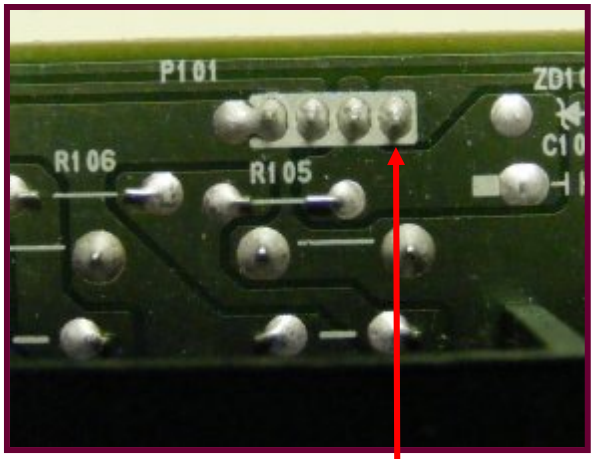
Voltage and Diode Mode Measurements for the Main Board

*STBY1 Main Power Switch “OUT”

P101 CONNECTOR “Ft Key PWB" to "Ft LED"

Pin	*STBY1	*STBY2	Run	Diode Mode
1	0V	3.29V	3.29V	Open
2	0V	3.29V	3.29V	Open
3	4.38V	Gnd	Gnd	Open
4	Gnd	Gnd	Gnd	Gnd

*STBY2 Main Power Switch “IN”



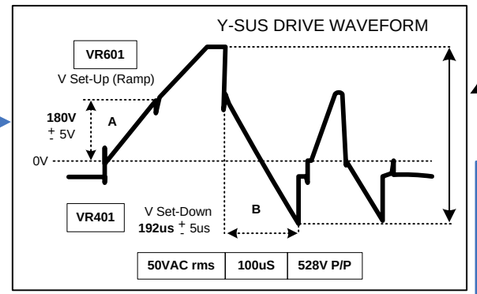
Diode Mode Readings taken with all connectors Disconnected. DVM in Diode Mode.

INTERCONNECT CIRCUIT DIAGRAM SECTION (11 X 17 FOLDOUT)

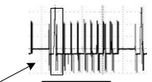
This section shows the 11X17 foldout that's available in the Paper and Adobe version of the Training Manual.

The Adobe version of this Training Manual allows the viewer to zoom in and out making reading of the small text easier.
This Power Point shows a graphical representation of the 11 X 17 foldout page so clarity is limited.

42PQ20 CIRCUIT INTERCONNECT DIAGRAM



Connect Scope between Waveform TP on Y-Drive and Gnd



Y-SUS TP

FPC P201 · FPC P202 · Waveform · TP · FPC P203 · FPC P204 · FPC P205 · FPC P206

Y-SUS Drive

P101 P203 · P103 P208 · P102 P205 · P104 P207

VSC TP · R520 · VR501 VSC · VR502 -VY · -VY TP R201 · Fusable Link · FL1 · C18

FL1 5V Fuse Floating Ground

To Check 5V to the Y Drive, measure across capacitor C18. The voltage is supplied thru FL1.

Y-SUSTAIN

No IPMs · No IPMs

P201 · FS202 (VS) 250V 4A · Glass

VR601 SET-UP · VR401 SET-DN

P206 · FS201 (5V) 125V 4A · FS203 (VA) 125V 10A · Fusable Links

P101 · 15V and 5V → · Ribbon Cable · Y-Drive Signals

P202 · FS501 (17V) 125V 4A · Va

P202

Pin	Label	STBY	Run
1	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd
3	Gnd	Gnd	Gnd
4	nc	nc	nc
5	*Va	0V	60V
6	*Va	0V	60V
7	*Va	0V	60V

*Varible according to Panel Label

P201 Y-SUS and P811 SMPS

Pin	Label	STBY	Run
1	Vs	0V	*193V
2	Vs	0V	*193V
3	nc	nc	nc
4	Gnd	0V	0V
5	Gnd	0V	0V
6	Va	0V	*60V
7	Va	0V	*60V
8	Gnd	0V	0V
9	M5V	0V	5V
10	M5V	0V	5V

*Variable according to Panel Label

P206

Pin	Label	STBY	Run
1	er com	0V	*94.9V
2	er com	0V	*94.9V
3	nc	nc	nc
4	Gnd	Gnd	Gnd
5	Gnd	Gnd	Gnd
6	nc	nc	nc
7	Vs	0V	*193V
8	Vs	0V	*193V

M5 (9,10) · Va (6,7) · Vs (1,2)

P811 · P813

P813

Pin	Label	STBY	Run	No Load
1, 2	17V	0V	17V	17V
3, 4	Gnd	Gnd	Gnd	Gnd
5, 6	12V	0V	12V	12V
7, 8	Gnd	Gnd	Gnd	Gnd
9, 10	9, 10	5V	5V	5V
11, 12	11, 12	5V	5V	5V
13, 14	13, 14	Gnd	Gnd	Gnd
15, 16	15, 16	Gnd	Gnd	Gnd/nc
17	5V Det	0V	5V	5V
18	AC Det	4.6V	4.6V	5V
19	RL On	0V	3.73V	0V
20	Vs On	0V	3.2V	0V
21	M5 On	0V	3.26V	0V
22	Auto Gnd	0V	0V	5V
23	Stby5V	5V	5V	5V
24	Key On	0V	0V	5V

SC101 A/C IN

R502 VA Adj · VS Adj · R901

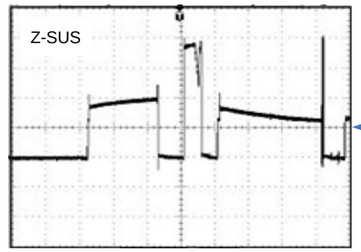
SMPS PCB POWER SUPPLY

P813

SMPS Test – Unplug P813 If all supplies do not run when A/C is reapplied, disconnect P811 to isolate the excessive load. This supply will operate with no external load. Use 2 (100W) light bulb test to check under load.

P2

Pin	Label	STBY	Run
1	Z SUS Dn	0V	0.79V
2	Z SUS Up	0V	0.13V
3	Z ER Up	0V	0.19V
4	Z ER Dn	0V	0.4V
5	Z Bias	0V	1.9V
6	Z Enable	0V	0.8V
7	Z Ramp Dn	0V	1.9V
8	Gnd	Gnd	Gnd
9	Gnd	Gnd	Gnd
10	+5V	0V	4.9V
11	+15V	0V	16.9V
12	+15V	0V	16.9V



41V (AC) rms · 400us · 200Vp/p

Z-SUSTAIN

P6 · FPC · Z-SUS Waveform TP J27 · FPC · P7

VZB VR8 · + VZB TP Right Side R49 or R50 To Chassis Gnd

P3 · P2 · 5V 17V · Z-Drive Signals

Note: P1002 only uses first 26 pins.

LVDS

P301 · IC305 · IC304 · P1002 P1004 · LVDS plugs into far left side · 25 Meg Only at Boot up

P1001 · P1005 · To keys and IR · To Speakers

Reset · X1 12 Meg · IC1 Micro · IC502 · X501 · Pin 19 · Pin 1 · TUNER

MAIN PCB

Grayed Out ICs are located on Back

IC305
1) 4.9V
2) 3.29V
3) 0V

IC304
1) 3.28V
2) 1.86V
3) 0.6V

IC502
1) 0V
2) 0V
3) 0.3V

Tuner
19) Video
16) Audio
4) 5V

No Connection · LVDS

IC221
Pin 1 (4.95V)
Pin 2 (3.3V)
Pin 3 (0V)

P131 · ROM Updates · P121 · X101 25 Meg · IC121 Pin 1 (5V) Pin 2 (1.8V) Pin 3 (0V)

IC221 · IC231 Pin 1 (4.95V) Pin 2 (3.3V) Pin 3 (0V)

FL111 FL112 5V Fuses

CONTROL PCB

Auto Gen · P111 · P101 · D201

With the unit on. If D201 does not blink on/off. Check 5V supply. If present replace the Control PCB

15V and 5V →

Short across the two points labeled Auto Gen to generate a test pattern.

Unplug all connectors. Jump 5V from SMPS (P813 pins 9~12) to pin 1 of IC121. Observe LED. If it blinks, most likely Control PWB is OK. FL111 and FL112 should be checked.

Disconnect P201 from the Y SUS Board and connect a Jumper from Pin 10 of P811 (M5V) to Pin 10 P201 (5V). The 5V will be routed to the Control Board via FS201, Ribbon Cable P101 on the Y SUS Board and FL111 and FL112 on the Control Board for Control Board operation verification.

✱ If the complaint is no video and shorting the points (AutoGen) causes video to appear suspect the Digital PCB.

P161 · P162

3.3V · Ribbon Cable · X-Drive Signals · 3.3V · Ribbon Cable

Va · Va

P211 / P311

Pin	Label	STBY	Run
1	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd
3	nc	nc	nc
4	*Va	0V	60V
5	*Va	0V	60V

*Varible according to Panel Label

P233 · P211 P232 · P331 P311

Note: 3.3V for X boards originates from IC221 on the Control board

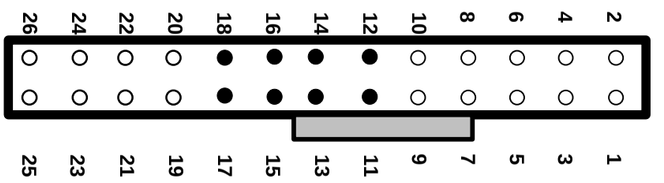
Note: 3.3V for X boards originates from IC221 on the Control board

LEFT X DRIVE

P201 TCP · P202 TCP · P203 TCP · P204 TCP · P205 TCP · P206 TCP

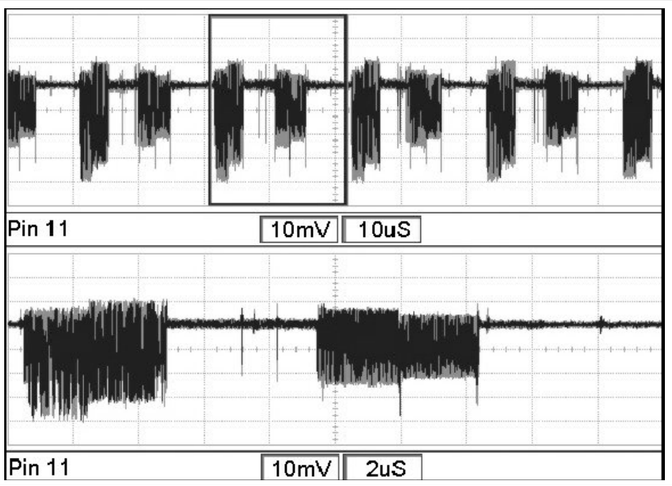
RIGHT X DRIVE

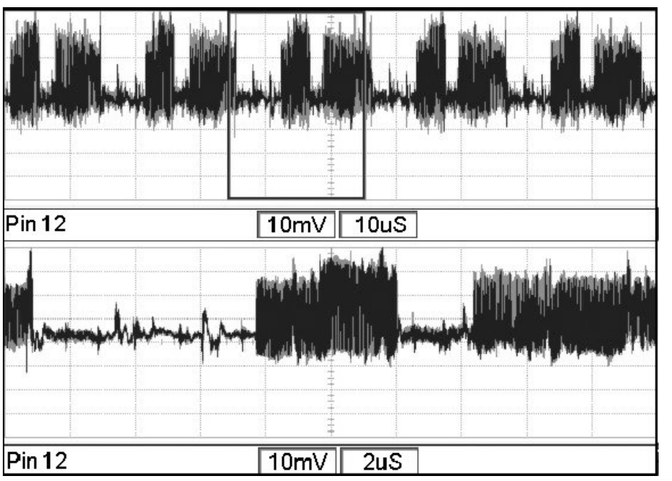
P301 TCP · P302 TCP · P303 TCP · P304 TCP · P305 TCP · P306 TCP

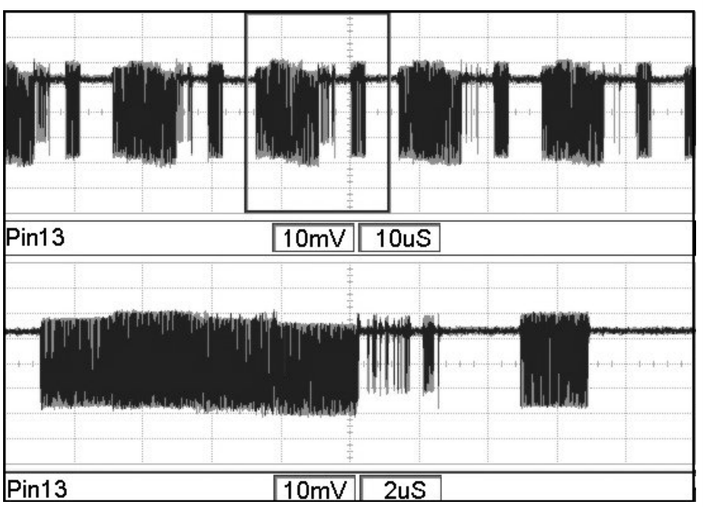


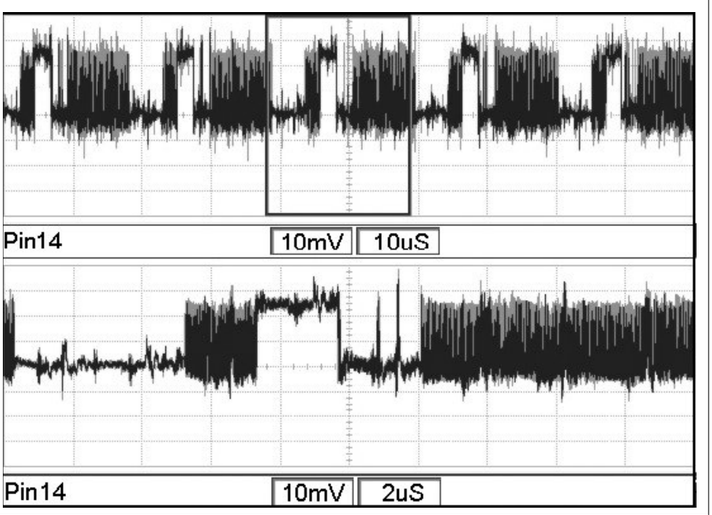
● - indicates signal pins.

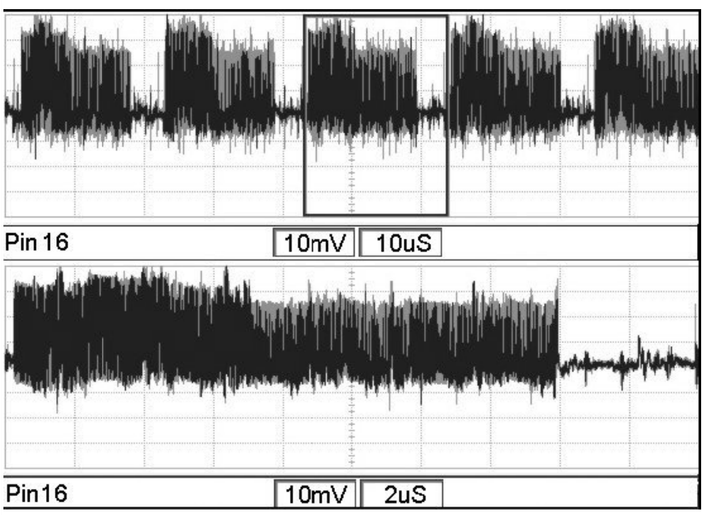
Connector P1002 Configuration

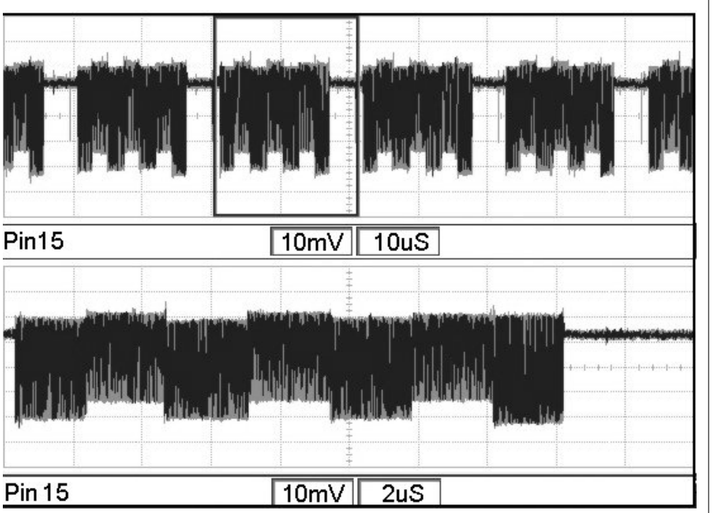


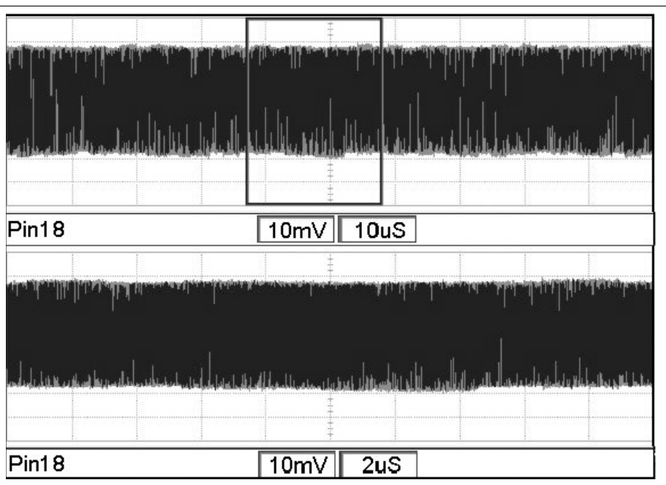


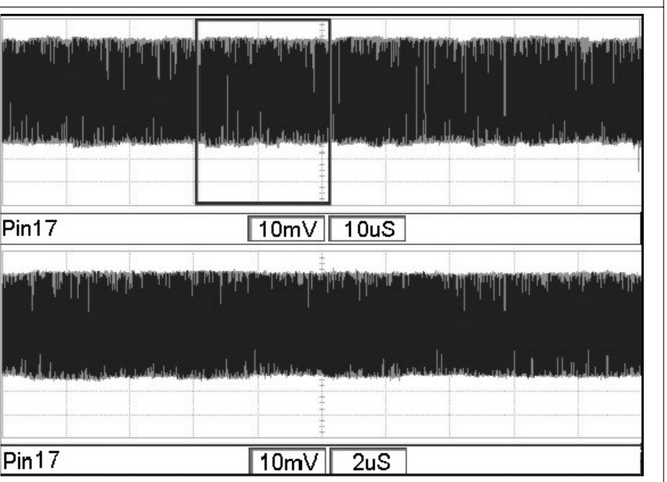








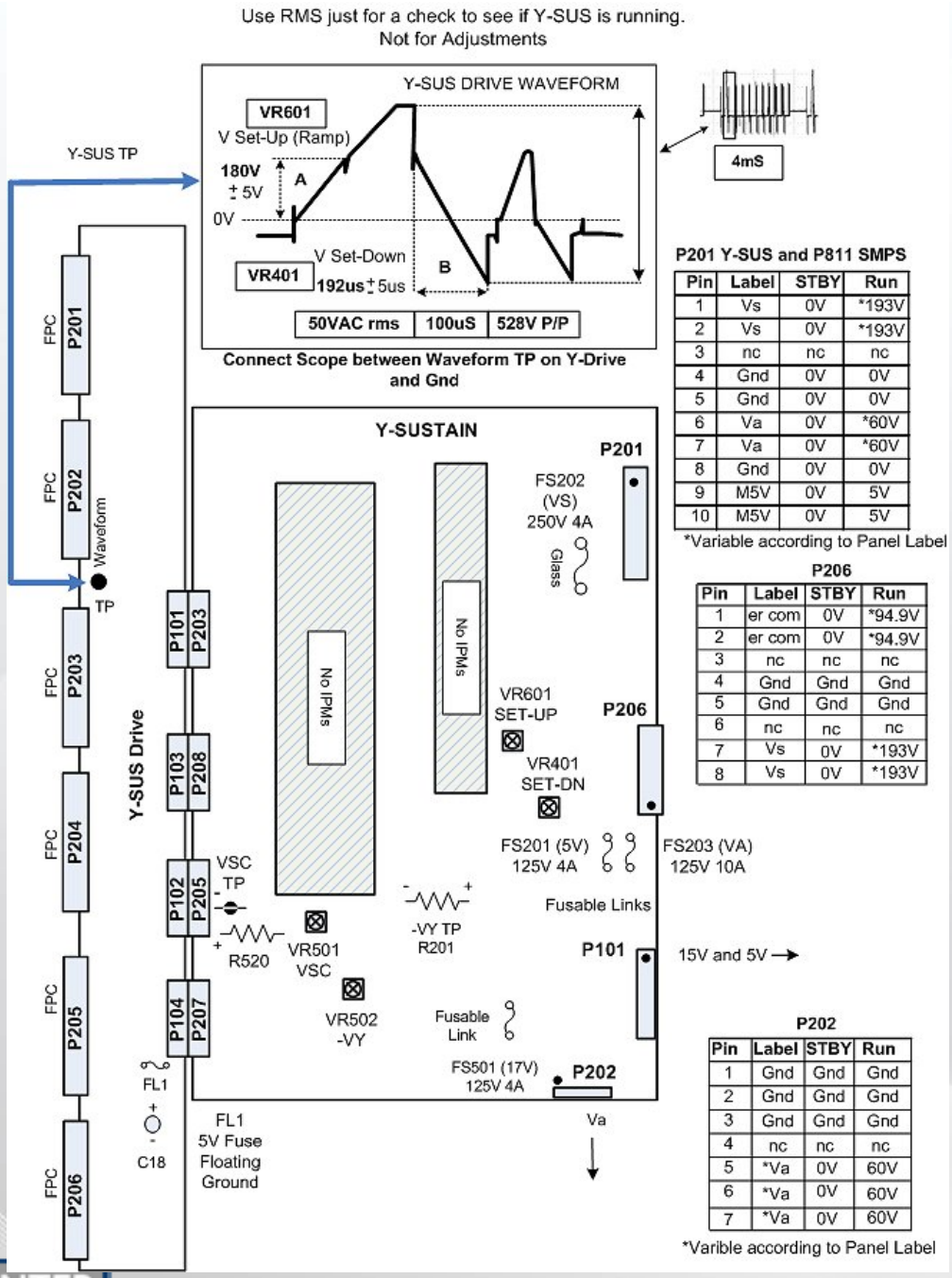




This concludes the Presentation

Thank You

Circuit Interconnect Blowup Y-SUS Section



P201 Y-SUS and P811 SMPS

Pin	Label	STBY	Run
1	Vs	0V	*193V
2	Vs	0V	*193V
3	nc	nc	nc
4	Gnd	0V	0V
5	Gnd	0V	0V
6	Va	0V	*60V
7	Va	0V	*60V
8	Gnd	0V	0V
9	M5V	0V	5V
10	M5V	0V	5V

*Variable according to Panel Label

P206

Pin	Label	STBY	Run
1	er com	0V	*94.9V
2	er com	0V	*94.9V
3	nc	nc	nc
4	Gnd	Gnd	Gnd
5	Gnd	Gnd	Gnd
6	nc	nc	nc
7	Vs	0V	*193V
8	Vs	0V	*193V

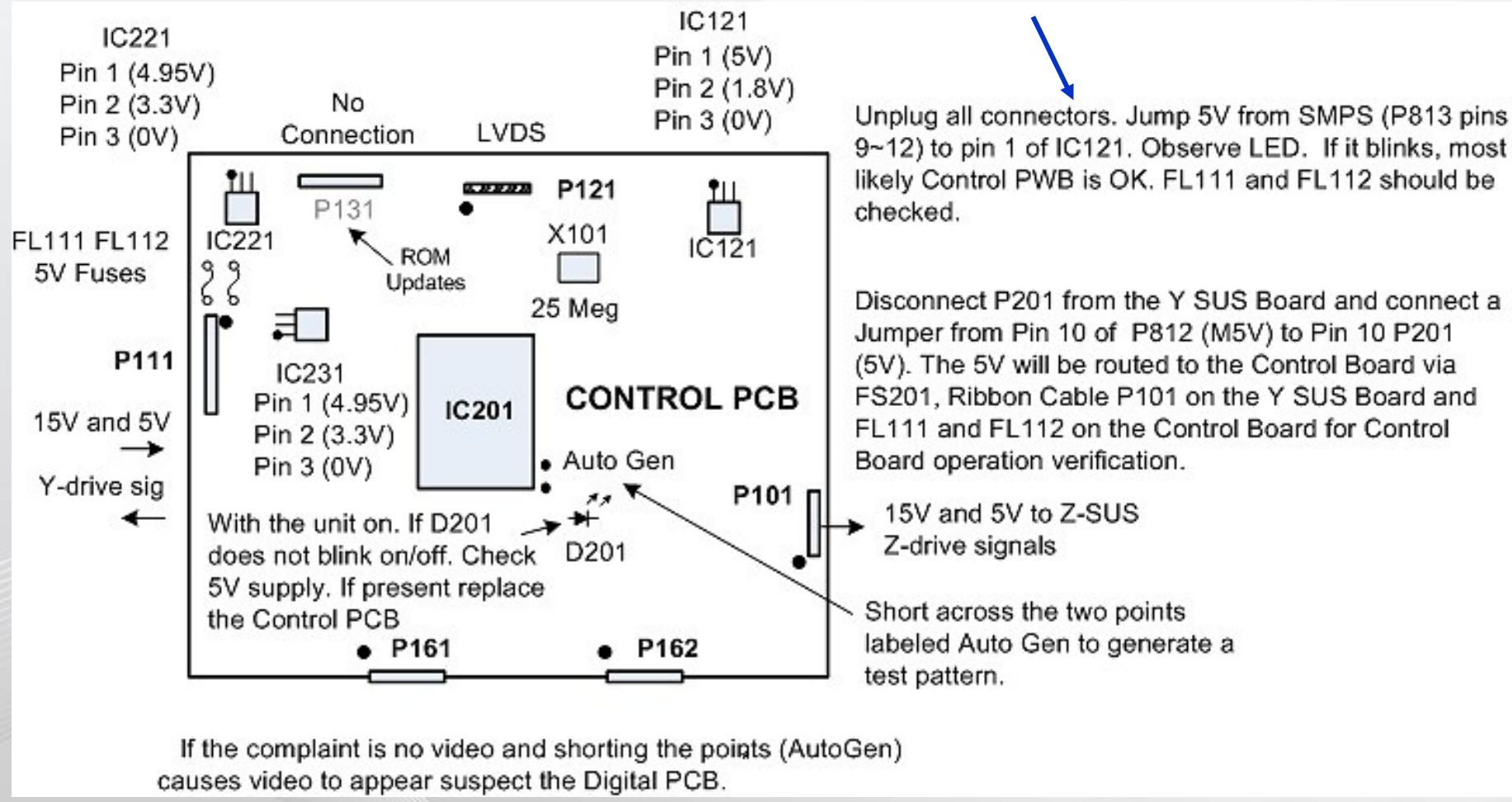
P202

Pin	Label	STBY	Run
1	Gnd	Gnd	Gnd
2	Gnd	Gnd	Gnd
3	Gnd	Gnd	Gnd
4	nc	nc	nc
5	*Va	0V	60V
6	*Va	0V	60V
7	*Va	0V	60V

*Varible according to Panel Label

Circuit Interconnect Blowup Control Board Section

Note: ***Pins 9 & 10 of connector P813 on the SMPS, if the supply is working, should have 5V which under normal operation supplies the Control Board with 5V via the Y SUS Board. By using 5V STB, the following test will confirm Normal operation of the Control Board if that supply is missing.***



If the complaint is no video and shorting the points (AutoGen) causes video to appear suspect the Digital PCB.